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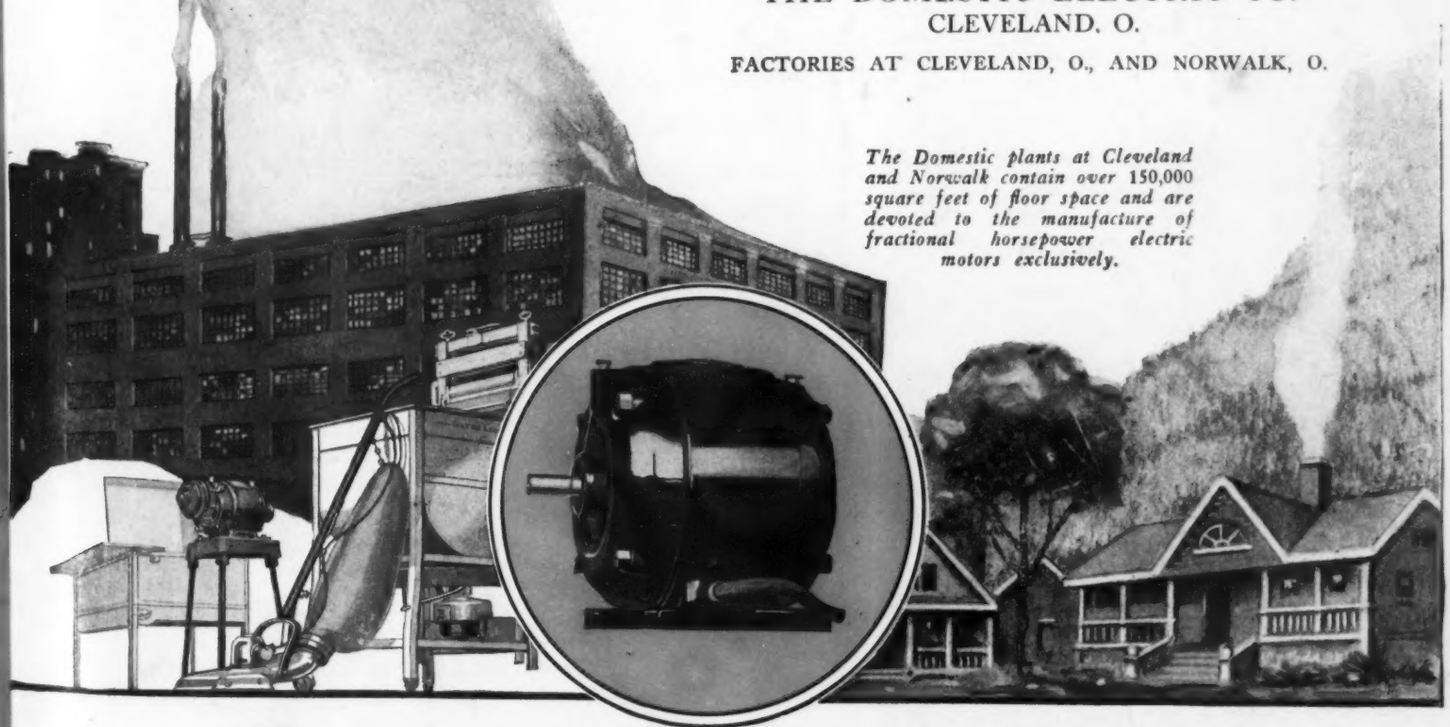

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Electrical World

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Educating Employees as to Company Activities

LUDICROUS errors on the part of an employee are often traced to ignorance of the things that his work requires him to handle. The most common mistake is made by clerks required to handle material records who attach to certain items unit prices whose incorrectness should be known at a glance, the clerk having no knowledge of the article or its use. Employees of the technical and operating departments make just as ridiculous errors when they attempt to deal with the work of the accounting department. The "information course" inaugurated by the Oklahoma Gas & Electric Company at Oklahoma City to correct such lack of knowledge is a praiseworthy move that can well be imitated elsewhere. Work along this line also helps to promote a spirit of co-operation between departments that can be assured only by a mutual understanding of one another's work and problems.

Water Powers Which Are Beautiful and Useful

BEAUTY is not always an attribute of nature, and if it were not for the ingenuity and skill of man, many of the priceless pearls of this world would still be shrouded in obscurity or plague the senses by their ugliness. There must be something radically wrong with the mind that is not moved by the grandeur of our mountain lakes, which resemble emeralds in settings outrivaling the skill of the goldsmith. To us it matters not whether the dam impounding the water be constructed by beavers or by an engineer, and yet we admit that there are in this world people to whom the first form of construction is sublime and to whom the latter form of construction is a desecration. Such is the perversity of man. A field of waving grain is a magnificent sight, and yet the farmer who would let it stand while people were clamoring for bread would be justly looked on as an enemy of mankind. A people that would go unhoused and unwarmed rather than cut down stately forests with which to build themselves habitations and fires would be fanatical. In the same category are those who would shut up from use the waters and timbers of our national parks when there is need for both and when their utilization will not detract from but rather add to the beauty of those reservations. Some one has discovered or imagined that our national parks are in imminent peril because it is possible to store the waters contained within their boundaries under the recently enacted water-power bill. This time the suggested legislation does not come in the guise of conservation, but the proponents consider themselves the champions of preservation of the natural beauty of our parks. We will admit that there may be cases where the erection of headworks might mar scenery, just as there may be cases where the creation of a lake from what was once a swamp might add to the attractiveness of the scene. Discretion in these matters may safely be left to the Federal Power Commission, and any attempt to limit the scope of the present water-power bill on that account is ill-advised.

Public Policy in Rate Increases

THAT rising costs, particularly in the case of coal, have weighed heavily on electric light and power companies is generally conceded. To reimburse the utilities for the excessive operating expense thereby occasioned commissions have as a rule permitted surcharges to be made temporarily. In a majority of cases these surcharges are made applicable to power contracts, residential consumers being specifically exempted. The reason for this seeming discrimination is that power customers can install isolated plants and generate their own energy if the rate is excessive, whereas with residential customers that is out of the question. We have yet to hear of any dissent from the reasonableness of such decisions. When, however, circumstances are such as to warrant the application of surcharges to all customers—and cases of this kind are not altogether rare—care should be taken not to offend public sensibility by the method of promulgation. It is not enough to abide by the letter of the law. That does not make for public good will, and as a matter of public policy it is better to have rate increases granted freely than to snatch them through technicalities. In the latter case the supposition is that the increase is not warranted. We view with alarm any action on the part of a utility which undermines public confidence in commission regulation. That bulwark should be strengthened and not weakened. Certain it is that the public will insist that commissions function properly or else it will do away with them for something more radical. It is better therefore to fortify commissions and endure them than to encourage some other form of regulation we know not of. The legislatures intended commissions to make rates, not merely to approve them.

France Rehabilitating Herself Electrically

A VIVID idea of the vital energy and recuperative power of war-stricken France is given in a short but striking illustrated paper by Major O. F. Allen this week. Within a year after the first invasion, before the grass had healed the shell holes in the battlefields of the Marne, the Chamber of Commerce of Paris was making preparations to furnish tools and equipment to

the devastated regions for repairing the wreckage of the war. One of the first important matters to be considered was the replacement of the wrecked and stolen electric plants and transmission lines, and a general system of tying together the power plants to exchange surplus energy was instituted, everything being at three-phase, 50 cycles, except the direct-current railway service. Thus the advantages of standardized systems was fully appreciated. The main transmissions ran from 5,000 volts to 120,000 volts. A standard rating of 5,000 kw. was selected for turbo-generators, and in 1917 units of this size were ordered from French builders to be available after the enemy had been driven out. By that year the extensive use of electric power along the western front had been inaugurated, and the war-time electric construction, carefully planned for peace-time purposes, is now being used for distribution.

In 1918 a 100,000-volt line from Switzerland was planned to serve the besieging armies gathering about Metz, and this line has now been completed by civilian activities. Even while the Germans were almost at the gates of Paris the electrical service and the engineers of the big electric companies were planning the high-tension network for the frontier over which the Germans were to be driven. This development had especially in mind the great industrial and mining areas along the western front, where the destruction of equipment by the Germans had been diabolically thorough. Part of the apparatus which was merely looted has been recovered, and the work of rehabilitation has gone on with a speed little short of astounding to those who have not full knowledge of French energy and devotion.

Intelligent First Attempt at Rural Service Regulation

RURAL distribution has reached an importance which has brought it definitely to the consideration of the Wisconsin Railroad Commission for actual regulation. The basis of three rulings recently made is given in this week's issue and is decidedly worth study as a very intelligent first attempt at formal regulation. Briefly, the commission recognizes the importance of developing rural business on a self-supporting basis, with proper provisions for carrying the necessarily large fixed charges and for insuring construction good enough not to involve hazards to other parts of the system, and with the probability of the same reasonable rate of return that is allowed on other kinds of electrical distribution. The commission evidently does not approve of the organization of local corporations among rural consumers, believing that it is an unnecessary complication and that the situation can be met more effectively by regulating the conditions under which existing utilities may take on the rural service.

The principles followed in the regulations are that when a sufficient call for rural service occurs the utility concerned shall investigate the situation as regards possible business, estimate a construction cost brought down to the lowest margin practicable, and shall then, when the work is undertaken, levy on the group of consumers the actual cost of construction and no more. A suitable connection charge, as in serving other customers, will be filed with the commission, and as business grows the original guarantors, so to speak, shall derive benefit from the gain in the form of refunds on the original payment of cost. All this is regulated much after the fashion taken by many utilities on their own initiative in cases where extensions to isolated groups of consumers have to be made. As to charges, the commission permits the regular rate for city service plus the actual amount by which fixed charges, energy losses and operating expense shall exceed the normal for city supply. Provision is made for annual adjustment in the rural charge, which must obviously vary as the business grows to the benefit of the consumer.

The various provisions of the commission sound somewhat complicated, but they seem to have been worked out on a sensible general basis. Experience will doubtless lead to some modifications; however, the main principles at least, if conscientiously applied, will insure a considerable extension of rural business on a basis that will not involve the supply company in speculative expense and will free the consumer from rates based in fact, if not in form, on the chances taken by the utility.

Conservation Which Does Not Save Is Futile

DISCUSSION of the conservation of fuel in a special session of the American Society of Mechanical Engineers at its annual meeting presented a curious complex of the practical and the visionary. That the nation is facing fuel shortage goes without saying, and the necessity for steps toward conservation is self-evident; but the discussion of the problem afforded an example of how far afield an engineer may go when once he escapes the boundaries of his own proper activities. In the discussion the central station, which is, by and large, the most efficient user of fuel, came in for rather sharp criticism as a waster of energy. Of course, if any plants are using old-fashioned and inefficient machinery or are careless in maintenance, they deserve criticism. However, those critics who blame the central station for not fully recovering the heat lost through condenser circulating water or the latent heat of vaporization by going into the heating business display singularly small practical knowledge of the economic problems involved.

We had thought that the timeworn scheme of constructing a bad power plant in order to obtain a somewhat efficient steam-heating plant had well-nigh passed into deserved oblivion, but it has bobbed serenely up again as if it had not been submerged over and over again by hard experience. In modern power plants practically no exhaust steam is returned to the atmosphere, and that which is condensed gives up a considerable amount of useful heat which is recovered. There is, of course, inevitable loss, and a large amount of capital has been from time to time sunk in experiments on auxiliary engines operated by working fluid of very low boiling point further to increase the final temperature range of the system. No broadly good results have followed, for it has generally turned out that the methods of conservation cost more than is saved, unfortunate as the circumstance may be.

So far as steam heating from central stations by use of the exhaust is concerned, that, too, has been tried by many a central station, and its possibilities have again and again been investigated. Nine times out of ten there is no available market at a price to justify the necessary expenditure. The tenth time the scheme succeeds only by reason of fortunate local conditions. But the sale of heat energy as steam or hot water from a central station is of necessity a forced sale, for the economic radius of action is small, and even central heating plants worked under far more advantageous

circumstances than are available at the central station have as a rule proved unsatisfactory save on a very limited scale. The central station's only safe policy is to save and utilize all possible waste heat, subject to the limitation that it must not impair the efficiency of its conversion into energy. A failure to accomplish more is chiefly due to the inexorable limitations of its temperature range.

Now and then there is opportunity for doing some of the things suggested in the discussion before us, like furnishing summer power to customers who need so much heat during the winter that they can then afford to operate a somewhat inefficient power plant. When a genuine case of this kind occurs the central station is ready with the goods. Industrial and building heating in connection with power production is, broadly, the will-o'-the-wisp of thermodynamics. In the somewhat rare cases when the scheme can be effectively employed no one is quicker to take advantage of it than the central-station operator, but he knows from experience how rarely it is sound policy.

Experience of San Joaquin Company Should Be Valuable to Others

THE maintenance problems of a distribution system with many plants, steam and electric, and several thousand miles of circuit are multifarious, involving equipment of very different kinds scattered over a large territory. Some of these problems are well set forth in a paper by E. A. Quinn and R. C. Denny regarding the practice of the San Joaquin Light & Power Corporation. Here is a case where the actual generating stations are thirteen in number, with more than forty substations and 3,700 miles (5,950 km.) of line. The apparatus therefore covers the widest possible range and the experience on this system should be of value on many another.

In the steam generating plants the turbo-generators form the principal equipment requiring close inspection. The advice is that turbines should be opened up and inspected as frequently as load conditions permit, especially in view of short circuits, which are more likely on transmission systems and which may impose severe stresses in the rotating parts. It may sometimes seem like unnecessary trouble, but if anything does go wrong owing to lack of inspection the damage is likely to be serious.

When generators fail it is likely to be due to lightning or other abnormal voltage, and the authors' suggestion that feeding the lines direct from a high-voltage generator increases trouble of this sort is worth noting. A transformer relieves the station equipment considerably. In this system, as generally elsewhere, the switching apparatus is the most considerable problem of maintenance. In the first place, oil switches are numerous, about 400 of them in this instance, and in the second place, when they are automatic and likely to open not infrequently, the chances of burning blades are considerable. Nothing except careful and frequent inspection and replacement of injured parts can overcome a source of trouble like this. For this a monthly inspection has here been found to be generally sufficient. Transformer troubles have been found here, as often elsewhere, to be most commonly due to broken bushings. It is interesting to learn that, although the average daily variation of temperature reaches 80 deg. F. during the summer, the effect on the insulators seems to be negligible, the most frequent cause of difficulty being malicious breakage by passers-by and grounding on the cross-arms by unlucky feathered trespassers.

Surface Creepage and Insulator Flash-Over

A SERIES of observations of the electrostatic charges appearing on the surfaces of insulating materials when subjected to high voltage are described by T. Nishi in the November issue of the *Journal* of the American Institute of Electrical Engineers. The observations, which were made with the proof plane and electrometer immediately after the removal of the voltage, show the presence of large values of charge and have many striking irregularities of shape. Such a method will indicate a residual polarization of the dielectric, and the combination of this with the copious ionization of the air surrounding the electrodes present in most of the experiments will account for all of the results. The interesting question is whether these charges are sufficient to affect materially the voltage gradient over an insulator. It is to be regretted that the author did not push his investigation into this field.

Most of the charges observed originated in corona or brush discharge. These discharges are not present around a transmission insulator under normal conditions of operation, and charges appearing on an insulator due to a transient corona would probably drift to ground rapidly under the normal voltage gradient over the surface. The continued presence of corona is always a danger signal, and the resulting spark-over may well be due to an accumulation of charges on the surfaces rather than to a direct stroke through the air. But if there is no corona present it appears doubtful whether these surface charges can exist in sufficient quantity to lower the flash-over voltage materially.

Mass Production Desirable in Industrial Heating Equipment

AT THIS stage of the industrial electric heating game development work occupies the head of the line. Practice is rapidly crystallizing into worth-while experience, but too little is yet known in the field of production about the possibilities of standardization through publicity and organized "missionary work" by manufacturers' representatives, jobbers' salesmen, retailers and central-station solicitors of new business. Any petty hiding of lights under bushels now to save future markets to patentees of this or that design may prove short-sighted in face of the world's need of comprehensive information about what is being accomplished with electricity in competition with other heating agencies. The more the gospel of industrial electric heating is spread abroad, supported by concrete examples of service results, the sooner executives and purchasing interests in industry will turn naturally to available apparatus for the solution of their problems. On the threshold of an advanced era thousands of installations will require special study and treatment, but just as standard motor designs have been fitted efficiently into varied machinery-driving situations, well-developed and stable designs of electric heating equipment can be applied with admirable economy if users and builders adopt and maintain a liberal policy in sharing their experience with the business world. Mass production, with its immense benefits to all, will follow.

Peter Junkersfeld

An electrical engineer with the ability to do big things to whom the government intrusted the problem of constructing the army's cantonments

A GOOD engineer must know how to get things done. He must be able to direct the energies of others. No matter how big the job, he must never quail, but pitch in and do it. In a measure these axioms characterize Peter Junkersfeld, now engineering manager for Stone & Webster. Although professionally rated as a central-station engineer in Chicago, he did not hesitate during the war to take on his shoulders the responsibility for the most extensive engineering project in this country, namely, the construction of the cantonments for the national army. Incidentally while doing this work he was in charge of other government construction which with the cantonments exceeded $600,000,000 in value. In no small measure was it due to his engineering ability that the United States was able to train 4,000,000 men in a year and a half after her entrance into the war. In fact, the government has recognized the services of this man who held a colonel's commission by awarding him the distinguished-service medal.

Colonel Junkersfeld's record with the Commonwealth Edison Company and its predecessor, the Chicago Edison Company, was sufficient recommendation to the government to warrant the responsibility placed on him. As assistant to Vice-President L. A. Ferguson, he shared in the supervision of the contract, operating and engineering departments of the electric light and power company carrying the world's largest load. He began as a helper the fall after he was graduated from the University of Illinois and quickly advanced through the electrical end of the business. He installed at Chicago the first engine-driven 25-cycle double-current units in America. He was for nine years in charge of the electrical construction and design of all the company's additions and new plants. Included in these is the Fisk Street plant of world-wide fame, which embodied many new features that have later come into extensive application.

He has acted many times in an advisory capacity to other electric light and power companies. Probably his most conspicuous work in this connection is his analysis and report of the St. Louis situation. His recommendations were accepted and resulted in the consolidation of the five existing distribution systems into a modern unified and comprehensive system. His executive ability was made plainly evident in his successful endeavors to increase the already cordial relations between the Commonwealth Edison Company and its employees. This he accomplished largely through the inauguration of a savings fund and annuity system and through his safety work.

Colonel Junkersfeld was born in Illinois Oct. 17, 1869, and except during the war lived there continuously until March of last year, when almost immediately after returning to civilian life he joined the Stone & Webster forces in Boston as engineering manager. He has always taken a keen interest in affairs of the industry. He is a past-president of the Association of Edison Illuminating Companies and a past-vice-president of the A. I. E. E., besides having served on numerous committees of various associations.

The Beauty of Use

Future Industrial and Agricultural Development of California, Nevada, Arizona and Idaho Are Limited by the Proposed Enlargement of the National Parks, Which Includes Water-Power Resources Essential to These States

At every waterfall two angels stay,
One clothed in rainbows, the other veiled in spray.
The first the beauty of the scene reveals,
The last revolves the mighty waterwheels,
And there those white-robed sisters ever stand,
Utility and beauty, hand in hand.

—Written in 1855.

WHEN Judge Payne, Secretary of the Interior, agreed last June to withdraw his objection to the water-power bill so that President Wilson could sign it within the lawful time he extracted a promise from Senators Walsh and Jones that at the next session an amendment would be brought in taking the waters of the national parks from under the Federal Power Commission's control. This amendment has been embodied in similar resolutions introduced in the Senate and the House. Innocent as the amendment appears on its face, its true meaning cannot be fully appreciated until it is considered in conjunction with the proposed plan for enlarging the national parks.

Development May Enhance Beauty

The school of thought represented by the American Civic Association would prohibit the storage of the water resources contained within the boundaries of the national parks, thus making impossible both the watering of the plains below for irrigation, agricultural and domestic purposes and the development of hydro-electric power to furnish light, power and heat to the people of neighboring states. Yet the greatest beauty in the world is the beauty of use.

It is possible in most instances to develop water powers without marring the natural beauty of nature. At Niagara Falls some of the power houses resemble Grecian temples of art and are surrounded by beautiful parks. The conduits and power machinery are hidden from view, and when one enters the power houses, looks upon those mighty hydro-electric appliances and ponders upon their diversified usefulness to man, he does not think of them as ugly, but remembers only the parks as fitting surroundings and the stately power-house structure as a proper housing for a still greater beauty, "the beauty of use." The imagination pictures the saving of coal effected, the hundred cities, towns and villages lighted, the factory wheels turned, the street cars operated, the agricultural communities served, and the thousand other facilities which these mightly engines of use provide for the comfort and well-being of man. Nearly always nature herself quickly repairs the scars necessitated by a hydro-electric installation. Within a year after the completion of the plant the rocks are covered with vines, and the only departure from primitive nature that can be seen is the red-tiled roof of the power plant nestling in a slight opening of the forest, or perhaps a beautiful lake, created for storage purposes, which adds to the beauty of the scene. In issuing licenses permitting development of water resources within national parks requirements can be made by government authorities which will permit of their utilization for the service of mankind and at the same time prevent defacement of the beauty of the natural surroundings.

While the present boundaries of the national parks in the Sierra Nevada mountain range inclose a comparatively small portion of the total area, yet the enlargement of the boundaries of the parks contemplated by bills now before Congress, and the creation of the proposed great Roosevelt National Park, would bring within their boundaries water resources the use of which is imperatively necessary to the future growth of the states of California, Nevada and Arizona.

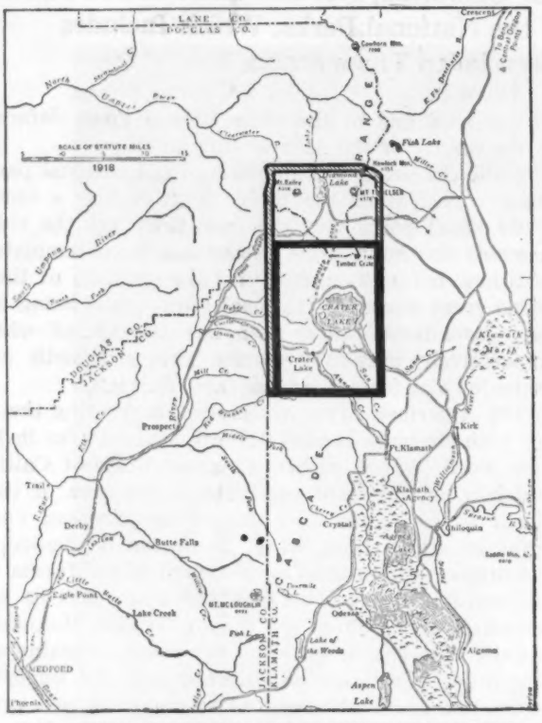
The American Civic Association is flooding the country with circulars headed "The National Parks in Imminent Peril." It is rather the great State of California which is in imminent peril, for if the area of the national parks should be enlarged as proposed and the right to utilize their water resources be denied, then the further agricultural development of California would be greatly impeded, because the state derives all its irrigation water from the Sierra Nevada Mountains.

California has no coal and her oil is becoming scarce and high. Coal can be obtained only by importation from such great distances as to make its cost prohibitive. The state depends absolutely upon the water powers of the mountains for its electric power, and if the boundaries of the national parks were enlarged, as proposed, so as to take in a large part of the mountain streams, and power development were prohibited, its future industrial growth would be seriously handicapped.

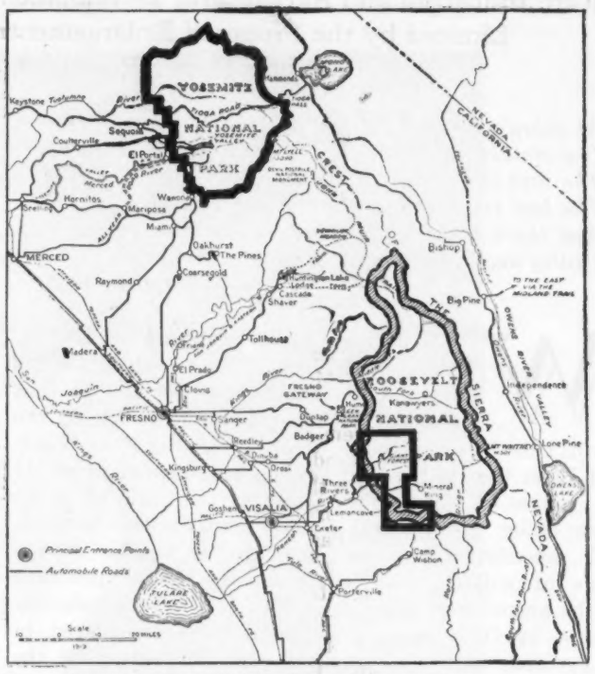
The menace to California would not come from the size of the area withdrawn but from the strategic location of the enlarged parks. This can be seen by the maps on the next page. A large portion of central and southern California is dependent for future growth upon the water resources of the Kings, Kern, Kaweah and San Joaquin Rivers and their tributary lakes and streams which find their source in the Sequoia and proposed Roosevelt National Parks.

Idaho Needs the Water

The people of northeastern Idaho are badly in need of water wherewith to increase their irrigated area by 200,000 acres of land. This land would bring forth $10,000,000 worth of food products annually and would support 10,000 additional people. The water for such beneficial use can be secured only by conserving and storing the headwaters of the Fall River, in the extreme southwestern portion of the Yellowstone National Park. The creation of a storage reservoir would cover about 8,000 acres of unsightly swamp land now infested with mosquitoes and flies and would create a beautiful lake. This portion of the park is never seen by tourists and never will be, for it contains no points of interest. Its scenery and natural conditions are exactly the same as may be observed over a course of 100 miles in approaching the park from the southwest. Here is a case where the beauty of the park would be increased by the development. Moreover, by utilizing this now wasting water 200,000 acres of now arid lands would be reclaimed and a thriving agricultural community established. Thus the water resources of a national park could be utilized

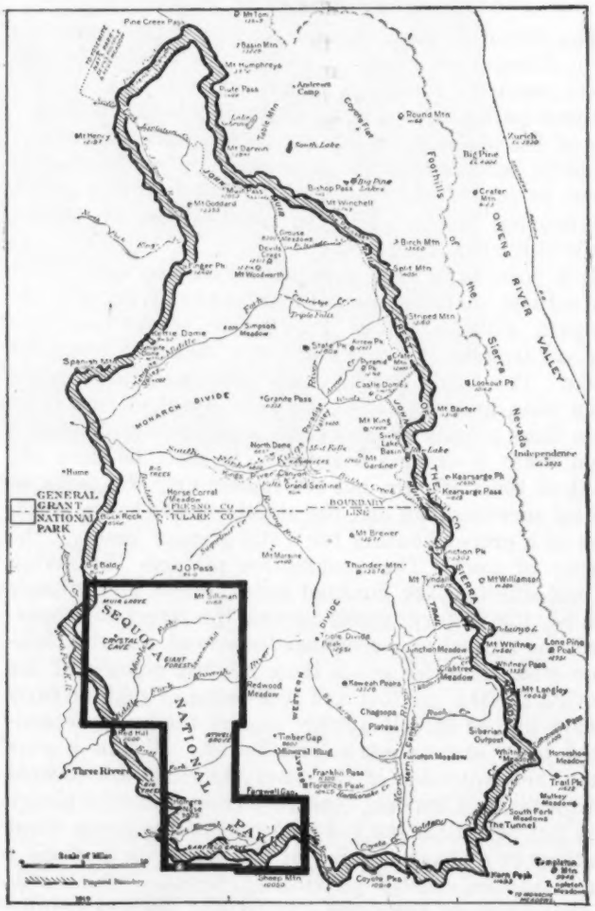


MAP SHOWING THE PROPOSED ENLARGEMENT OF THE CRATER LAKE NATIONAL PARK



MAP SHOWING THE PROPOSED ROOSEVELT NATIONAL PARK IN RELATION TO YOSEMITE NATIONAL PARK

MAP SHOWING PROPOSED ENLARGEMENT OF YELLOWSTONE NATIONAL PARK AND DEVELOPMENT OF SOUTHERN ENTRANCE


GENERAL GRANT NATIONAL PARK
SEQUOIA
NATIONAL
PARK
Foothills of
OWENS RIVER VALLEY
Sierra Nevada
Mt. Whitney
Lone Pine Peak
Mt. Langley
Mt. Williamson
Mt. Tyndall
Mt. Barnard
Mt. Brewer
Mt. Gardiner
Mt. King
Mt. Baxter
Mt. Goddard
Mt. Woodworth
Mt. Winchell
Mt. Humphreys
Mt. Tom
Mt. Darwin
Mt. Morgan
Mt. Silliman
Mt. Hilgard
Mt. Henry
Mt. Oddonino
Mt. Keerserge Pk.
Keerserge Pass
Kaweah Peaks
Kaweah Gap
Castle Dome
Castle Dome Meadow
Monarch Divide
Granite Pass
Timber Gap
Mineral Mtn.
Franklin Pass
Franklin Peak
Farewell Gap
Farewell Cr.
Three Rivers
Redwood Meadow
Chagoopa Plateau
Siberian Outpost
Lodgepole Meadow
Tunnel Meadow
Horseshoe Meadow
Trail Pk.
Muttey Meadow
South Park Meadows
The Tunnel
Crabtree Meadow
Whitney Pass
Lone Pine
Big Pine
Bishop Pass
Big Pine Creek
Crater Mtn.
Birch Mtn.
Split Mtn.
Striped Mtn.
Lookout Pk.
Independence
Kearsarge Pk.
Kearsarge Pass
Round Mtn.
Appletree Camp
Lake Sabrina
South Lake
Lake Darwin
Lake Winchell
Lake Basin
Lake Basin Mtn.
Pine Creek Pass
Pine Creek
Basin Mtn.
Mt. Humphreys
Mt. Tom
Mt. Henry
Mt. Darwin
Mt. Morgan
Mt. Silliman
Mt. Hilgard
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Mt. Winchell
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Mt. King
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Mt. Brewer
Mt. Tyndall
Mt. Barnard
Mt. Williamson
Mt. Whitney
Mt. Langley
Lone Pine Peak
Kearsarge Pk.
Kearsarge Pass
Kaweah Peaks

for much-needed purposes and the beauty of the surrounding scenery be at the same time greatly increased.

The necessity for the development of the water powers of the country is shown by the fact that since the enactment of the federal water power law in June last the Federal Power Commission has received 102 applications for permits, which will, if taken advantage of, mean the development of 7,500,000 hp. This would cost more than a billion dollars and would create taxable values of that amount. The work would require hundreds of thousands of men for a number of years, would save 50,000,000 tons of coal, would cheapen the cost of many of the necessities of life and would be of direct benefit to every inhabitant of the United States.

The foreign nations — France, Italy, Switzerland, Sweden and other countries — immediately after the close of the war turned their attention to the development of their water powers. The shortage of coal during the war had given them a tremendous object lesson as to the value of power, and the very first constructive thing they did was to begin the utilization of their wasting water powers. The foreign countries have cheap labor, which this country has not. The development of their water powers is going to give them cheap power, and with these two elements of cost upon a very low basis, they will be placed in a commanding position in bidding for the markets of the world. If the United States is to compete with Europe in foreign trade it must at least have cheap power for industrial use.

WILL HELP REDUCE H. C. L.

In the western part of the country there are more than 10,000,000 acres of land which cannot be reached by gravity water and can only be reclaimed by water pumped by the electric power now wasting. It would require fully 5,000,000 hp. to operate these pumping plants. An agricultural population of fully 500,000 could be maintained on these acres, and the products would materially tend to reduce the cost of living.

The electrification of a thousand miles of the Chicago, Milwaukee & St. Paul Railway has shown such economies in transportation costs that other Western roads are planning to do likewise whenever the water power is developed.

The enactment of the federal water power law has opened up an enormous field for pioneer enterprise. Those who would develop our wasting water powers will reclaim deserts and make farms, build factories and cities, open up new inland waterways, employ labor, reduce the cost of living, increase taxable values and thus promote the welfare and prosperity of the nation.

The water-power act provides "that licenses shall be issued within any reservation [including national parks and monuments] only after a finding by the [Federal Power] Commission that the license will not interfere or be inconsistent with the purpose for which such reservation was created or acquired, and shall be subject to and contain such conditions as the secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservation."

Thus the Department of the Interior, which has supervision of the national parks, can by wise administration permit the utilization of the water resources so necessary to the growth of the Pacific Coast States and at the same time fully protect the natural wonders contained in the parks, with the result oftentimes of enhancing the beauty of their surroundings.

Electrifying the Foundry Core Room

Cores Baked in Electrically Heated Ovens Shown to Have 50 to 200 per Cent Greater Strength than Those Baked in Fuel-Fired Ovens

BY J. L. JONES
Westinghouse Electric & Manufacturing Company
Experimental Laboratory.

PRESENT-DAY foundry practice calls for closer attention to the core department than was given it in the past. Core baking in particular has received little attention, and the old fuel-fired ovens, which had in most cases neither insulation nor temperature control, are being supplanted by electric ovens.

Tests which have been run on recently installed equipments have shown that the electric oven has the following advantages: Uniformity of temperature, freedom from gases, higher speed of baking and more uniform quality. No attempt was made in the tests to obtain very accurate readings of the energy consumed, but it is estimated that about 12 lb. (5.4 kg.) of green cores were baked for each kilowatt-hour.

TABLE I—THREE CORE MIXTURES WHICH WERE BAKED FOR TEST PURPOSES IN OVENS HEATED BY ELECTRICITY, GAS, AND GAS AND OIL

	No. 3 Molding Machine Work. Per Cent	No. 4 Heavy Bench Work, Per Cent	No. 7 Splicer Cores Only, Per Cent
Silica sand	63.92	16.03	97.30
Molding sand	21.35	.....	.....
Sand-blast dust	11.88	19.60	.....
Old core sand	.....	64.14	.....
Oil	1.78	.....	2.03
Dextrine	1.04	0.23	0.67

The tests were made to determine what would be satisfactory baking conditions for the electric core oven and to ascertain some of the advantages of this oven over fuel-heated ovens. It was not intended to deal specifically with any particular type of oven, but to investigate some of the advantages of electric heat in an oven where ventilation is carefully regulated, the temperature accurately controlled and the heaters so

TABLE II—COMPARATIVE STRENGTH TESTS WHICH WERE MADE ON FOUNDRY CORES BAKED UNDER VARIOUS CONDITIONS

Mixture	Temperature (Deg. Fahr.) Initial	Final	Baking Time, Hours	Crushing Load (Lb.)	Tensile Strength (Lb.)	Per Cent Moisture—Core Sand	Baked Cores	Energy Consumed (Kw.-hr.)
ELECTRICALLY HEATED OVEN								
No. 3	300	300	3	253	21	5.74	0.18	40
No. 3	300	450	1½	1,739	187	5.44	0.13	40
No. 3	500	500	1	1,516	142	5.44	0.11	20
No. 4	350	350	1½	776	46	6.38	....	20
No. 4	400	400	1½	1,206	105	6.47	0.16	20
No. 4	450	450	1½	1,550	142	6.38	0.14	30
No. 7	300	300	1	815	97	....	....	20
No. 7	350	350	1½	1,313	118	6.13	....	30
No. 7	400	400	2	3,854	342	....	....	50
OVERHEAD-GAS-HEATED OVEN								
No. 3	...	...	2	407	62	5.44	0.12	..
No. 4	...	...	2	776	65	6.38	0.14	..
No. 7	...	...	2	667	87	6.17	....	..
GAS-AND-OIL-FIRED OVEN								
No. 3	...	...	½	832	140	5.44	0.16	..
No. 3	...	...	2½	1,519	102	....	....	..
No. 4	...	...	1	633	57	6.38	0.69	..
No. 4	...	...	2	779	78	6.38	0.16	..

placed as to give a uniform temperature in all parts of the oven.

The oven used was of a draw-shelf, commercial type. It was 5 ft. 8 in. (1.75 m.) wide, 6 ft. 8 in. (2.03 m.) deep and 7 ft. 6 in (2.29 m.) high, of sheet-steel construction, with walls about 4 in. (10 cm.) thick, fairly well insulated except on the bottom, where the concrete floor allowed the escape of considerable heat. The oven was equipped with a fan driven by an adjustable-speed motor and so arranged that the air could be exhausted or recirculated or a portion could be exhausted and the rest recirculated. Accurate thermostatic control was provided.

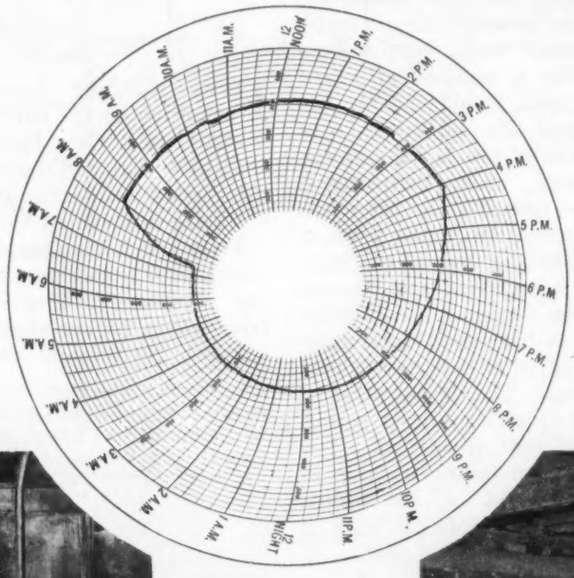
As it was desired to ascertain the conditions under which cores of the very best quality could be produced, a number of runs were made on each of the above mixtures, varying the temperature and time of baking. Test cores of two kinds were used to judge thoroughness of the baking. For the tensile test the regulation brass molds designed for making specimens for cement testing were used, and for compression a 2-in. (5-cm.) cube was made. Compression and tensile test pieces were placed on the top, middle and bottom shelf with each lot of cores.

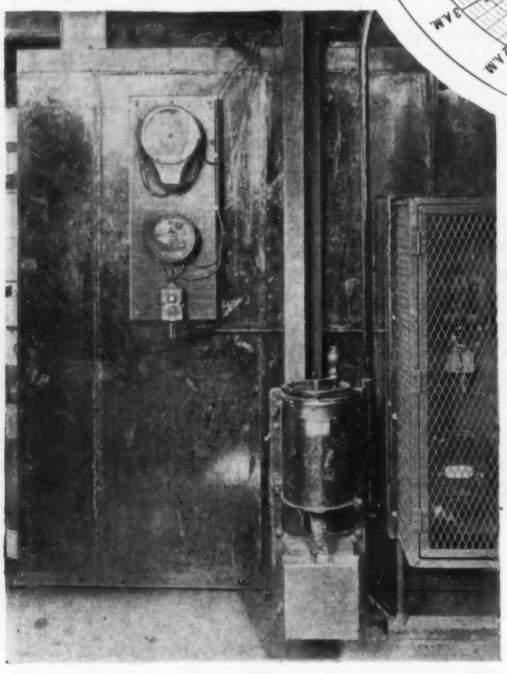
Prior to making the tests a number of runs were made to insure the satisfactory ventilation of the oven. In this case the oven was operated at a constant temperature of 400 deg. Fahr. and loaded with weighed charges of production cores, test pieces being placed on the top, middle and bottom shelves. The rate of change of the air in the oven was controlled by dampers and the speed of the motor, the air pressure being registered with Pitot tubes. The changes of air were obtained by calculation from the volume of the oven and the pressure temperature of the air exhausted and recirculated. Recirculating the air thirty times per hour was the rate decided upon and used in the tests made.

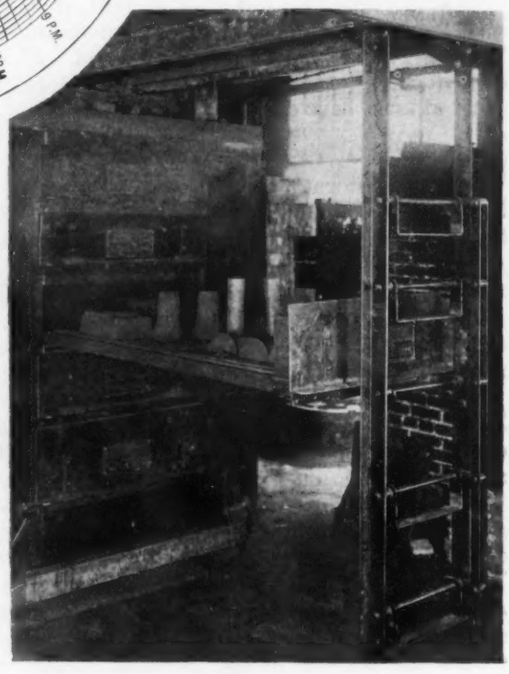
The results obtained in the comparative tests show that the electrically heated oven produces cores having from 50 to 200 per cent greater strength than the fuel-fired ovens. In baking large cores containing oil it is customary to heat at a low temperature at first to allow the moisture to escape before the oil hardens. The first tests on No. 3 core mixture showed, however, that this is unnecessary on small cores. The excessive moisture (26.70 per cent) which was found on one test did not crack the cores or injure them in any way. It is undesirable, however, as energy is wasted in expelling it. An inspection of the results obtained indicates that baking at 450 deg. Fahr. for somewhat less than one hour gives the best results. The dextrine binder seems to be weakened by prolonged baking above 400 deg. Fahr. However, overbaking by 50 per cent does little harm. One lot of cores containing oil which was baked overnight because of neglect to turn off the current was found to be of good quality. When forcing an oven at a high temperature, time-clock control or an alarm clock is useful to indicate when the cores should be removed to prevent overbaking and waste of heat.

It was found that the weight of the cast-iron core plates was almost equal to the weight of the cores. It is desirable to reduce the weight of the core plates to the minimum consistent with stiffness. However, the current loss due to heating these plates is only about 20 per cent of the radiation loss of the oven.

This information was presented before a recent meeting of the American Foundrymen's Association.







Electric Core-Baking Ovens Are Supplanting Fuel-Fired Equipment Because of Proved Superior Operating Results

Control equipment for a shelf-type oven is shown in the view on the left. The temperature control is by thermostat, the graphic chart indicating the exactness of regulation. As shown on the right, the draw shelves are pulled out on a roller carriage.

Factors Governing Rural Extensions

Six That Need Careful Consideration Are Pointed Out by Wisconsin Commission in Approving Rural Service Rules—Features of Rules Are Cited—Basis for Rates, Financing and Ownership Are Discussed

By G. C. NEFF
General Superintendent Wisconsin Power, Light & Heat Company, Madison, Wis.

ADMITTING that rural extension presents so many problems that rules to cover adequately all the points that may arise are out of the question, the Wisconsin Railroad Commission has none the less approved regulations which it holds cover the more important factors and the application of which will provide data for the further development of the code. The rules in question were filed by the Wisconsin Power, Light & Heat Company, the Central Wisconsin Utilities Company, the Wisconsin Valley Utilities Company and by several other Wisconsin light and power companies. They have since become known in discussion as the Wisconsin rules, though the commission has not made them mandatory for the entire state, feeling that much more development work and investigation must be carried out before a final and definite code can be adopted. At present this code constitutes the most definite and probably the most consistent step that has yet been taken in solving the problem of rural service.

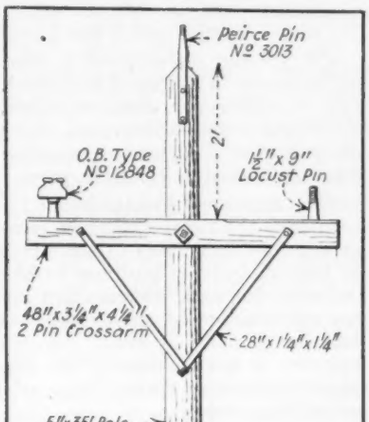
Factors to Be Considered

Several definite factors were pointed out by the commission as needing careful consideration on the part of utility men. They are as follows:

(a) It is important that a utility develop its rural business on such a basis that it will be self-supporting within a reasonable time and impose no undue burden on the urban consumer.

(b) The fixed charges, losses and operating expenses are much greater than the same items for an equivalent income from urban business.

(c) Adoption of high construction standards may in many cases make the service prohibitive in cost, but the connection of inadequate or unsafe construction to the transmission or distribution systems of a utility introduces a hazard to the entire service which cannot be tolerated.

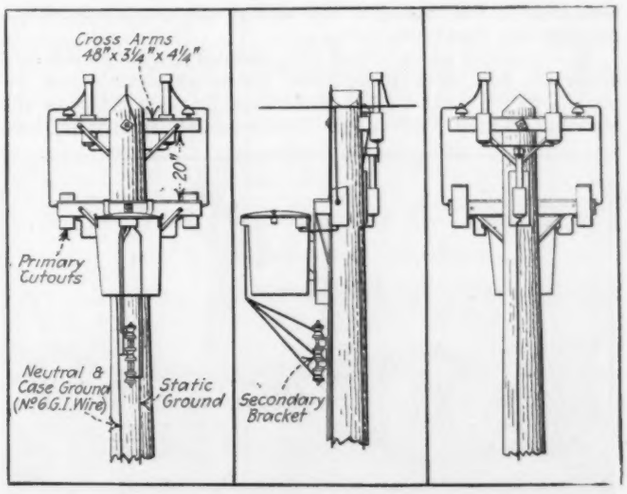


POLE-TOP CONSTRUCTION FOR RURAL LINES

Suitable for single-phase in beginning and convertible to three-phase when necessary. The ground wire is coiled in a spiral of three turns and stapled to bottom of pole. The riser is similarly fastened every four feet.

(d) To encourage development of rural service the business must earn the same rate of return that is considered reasonable in the urban portion of the utilities business and the utility must be permitted to make terms as to financing which will render possible the immediate investment of considerable sums in rural extensions without taxing the resources of the utility for obtaining capital.

(e) The organization of rural consumers into corporations forces the rural consumer into a business



TRANSFORMER MOUNTING FOR 6,600-VOLT RURAL LINES

about which he knows little, burdening him with the expense of an organization and the compilation of comparatively unimportant but legally necessary reports, and places responsibility for maintenance of lines and equipment in inexperienced hands, with all the consequent liability to trouble.

(f) While the rules do not provide for apportionment of the cost of lines among the various consumers, it is the opinion of the commission that a rural extension should, as far as practicable, be considered a community enterprise in which all will benefit equally, even though in the final analysis strict justice would probably demand that no consumer should pay more as a member of a group than he would if he were served under the rules as an individual.

The foregoing points must be thoroughly considered in any scheme of rural service and carried in mind in the discussion of the following rules:

Rules Governing Rural Service

I. *Rural Extensions Defined.*—Rural extensions as herein used shall include all extensions to distribution systems built primarily to serve consumers located outside the corporate limits of cities or villages or other territory which has the character and density of population similar to urban conditions.

II. *Cost of Extensions Defined.*—Estimated construction cost shall include all material, labor and other expense required for the distribution and installation of poles, wire, crossarms, insulators, line hardware, switching and protective devices, transformers, appurtenances, right-of-way permits, etc. Metering equipment shall be supplied by the utility, and the cost of same shall not be included in the estimated construction cost.

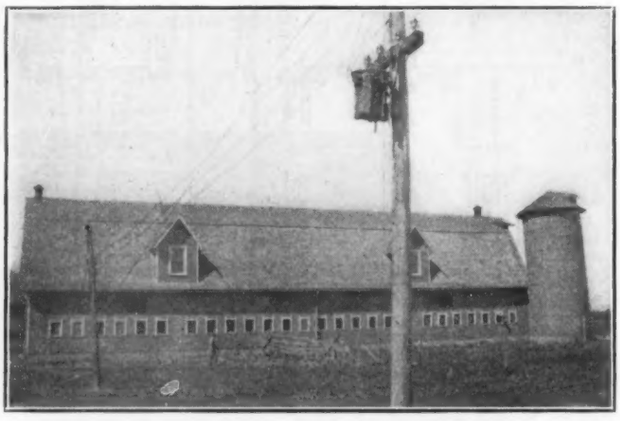
An item not exceeding 10 per cent of material cost shall be included to cover purchasing expense, freight, cartage to storeroom and stores department expense.

An item not exceeding 15 per cent of all above-mentioned items shall be included to cover general overhead, engineering, promotion, office supervision, clerical labor, contingencies, etc.

III. *Analysis of Extension.*—When one or more prospective rural consumers make application for electric service the utility will investigate the extension, ascertain the number of consumers who can be advantageously served, the number who will contract for service under the terms herein prescribed, and will estimate the construction cost as outlined in Rule II.

IV. *Payments by Consumers.*—When the prospective consumers shall have paid to the utility the estimated construction cost of the extension the utility will construct the extension and render service.

If the actual construction cost exceeds the estimated construction cost each prospective consumer shall, upon demand, pay a part of the difference in proportion to the amount originally advanced. If the actual construction cost



ELECTRICITY CAN BE USED FOR THRESHING, ENSILAGE CUTTING, MILKING, ETC.

The demand for electricity in rural districts exists, so that if the service is properly financed the business may become profitable eventually.

is less than the estimated construction cost, the utility will refund the difference to the consumers in proportion to the amount advanced.

V. *Connection Charge.*—Before service is rendered from an extension a connection charge shall be filed with the commission, which charge shall be applicable to additional rural consumers desiring connection to the extension subsequent to the consummation of the original agreement.

This connection charge shall be determined by dividing the actual construction cost of the extension by the number of original consumers.

If an additional consumer desires connection to an extension and can be connected in such a manner that the estimated cost of the line extension required is less than the connection charge the consumer shall pay the connection charge to the utility and the utility shall connect the additional consumer and render service.

The difference between the actual cost of the line extension required to serve the additional consumer and the connection charge paid by the additional consumer shall be refunded to the consumers, including the additional consumer, in proportion to the total amount paid toward the construction cost. In case an additional consumer desires connection to an extension and the estimated construction cost of the required extension is greater than the connection charge the consumer shall pay to the utility the actual cost of the extension instead of the connection charge and no refunds will be made to the original consumers.

In case an urban consumer is connected to a rural extension in such a manner that the actual cost of connection is less than the free limit as defined in the urban rules of the utility, then the difference between the urban free limit and the cost of connection of the additional urban consumer shall be refunded to the original rural consumers in proportion to the amounts advanced.

VI. *Rates.*—The rates for rural service shall be: (a) A rural charge plus (b) the regular urban rates.

(a) *Rural Charge.*—The rural charge shall cover the amount by which the fixed charges, energy losses and operating expenses incident to rural service exceed the corresponding items for city service.

1. Annual rural charge for extension: The annual rural charge for the extension shall be equal to 10 per cent of the total construction cost of the extension plus the total transformer core losses per year computed at a rate of 1½ cents per kilowatt-hour minus 13½ per cent of two times that part of the annual revenue from the extension which is computed at the regular urban rates.

2. Annual rural charge for individual consumer: The annual rural charge of the individual consumers will then be determined as follows: Fifty per cent of the total annual rural charge shall be apportioned equally among the consumers. Fifty per cent of the total annual rural charge shall be apportioned among the consumers according to installed transformer capacity. In case two or more consumers are served from the same transformer the installed transformer capacity for each consumer shall be considered as the estimated portion installed for the requirements of each individual.

3. Monthly rural charge: One-twelfth of the annual rural charge so apportioned to each consumer shall be billed monthly by the utility and paid by the consumer as the monthly rural charge.

(b) *Regular Urban Rate.*—In addition to the rural charge the consumer shall pay the regular rates charged for service in the adjacent urban community where the extension originates. This charge will include all minimum-service and demand charges which are a part of the urban rates.

VII. *Annual Adjustment in Rural Charge.*—Adjustments will be made in the rural charge at the end of each calendar year to allow for changes in the number of consumers, changes in revenue from line, changes in transformer capacity, etc., and the rural charge then fixed shall be effective for the folllowing calendar year.

VIII. *Combined Transmission Line and Rural Extensions.*—In case the rural extension is constructed for use partly as a transmission line to some large consumer, city, village or hamlet and the business to be derived from the use of the extension as a transmission line is inadequate to justify the construction of the extension without a portion of the cost being paid by rural consumers the matter shall be referred to the commission for determination as to the fair apportionment of costs in case of failure of the parties involved to agree.

IX. *Title to Extensions.*—The title to all extensions toward which consumers have advanced money shall remain with the utility.

X. *Extensions from High-Voltage Transmission Lines.*—Rural extensions from transmission lines of over 15,000 volts may be considered special by the utility.

[XI.-XV. Five other rules are included, covering access to premises, inspection rights, continuity of service, urban rates and default, but they are not peculiar to rural service nor are they new.]

BASIS OF RATE FORM

The largest amount of discussion has centered about the form of rate. The cost of serving a rural consumer was divided into operating and maintenance expense, power losses, depreciation and taxes. On these

items the urban rate covers the normal, while the excess for rural service must be covered by the rural charge. In addition, the return on investment was considered, but this is covered by the urban rate, since no investment other than metering equipment is made

	Per Cent
Excess operating and maintenance expense, based on the rather meager data available	2.5
Depreciation	4.0
Taxes	1.5
Allowance for hazard and cost of developing the business	2.0
Total	10.0

by the utility. The basis of the 10 per cent factor is as shown in the accompanying table.

Taking 10 per cent on the total cost of a rural extension duplicates the factors covering the same items in the urban rate, and a correction factor to eliminate the duplication is necessary. This was arrived at by examining data from twenty-five utilities, by which it was determined that the normal investment in distribution systems per urban consumer was approximately twice the annual revenue. Thirteen and one-half per cent (returns, 8 per cent; depreciation, 4 per cent, and taxes, 1½ per cent) of the normal investment per consumer (*i.e.*, twice the annual revenue) was therefore eliminated from the 10 per cent factor in the rural charge.

In the consideration of losses the committee assumed that the total primary loss, transformer copper loss and secondary loss in rural service is equal to the same losses in city service, and the excess energy loss in rural distribution was considered as equal to the total core losses of all transformers used in supplying rural service. As originally formulated, the rules called for computing this part of the rural charge at the utility's power rate, but the rules as filed were amended to require computation at 1½ cents per kilowatt-hour.

The statement of the method of calculating the rural charge is confusing at first glance, but analysis indicates that it is along the right lines, the method of statement being due to a lack of definite data which will be supplied by careful analysis of extensions made under the rules. The attempt was to establish a principle rather than a definite rate. Concentration on the study of the factors involved will solve the specific problem and produce a clearer statement of the rule.

COST OF EXTENSIONS, FINANCING AND OWNERSHIP OF LINES

The method of estimating cost of extensions is important, as it recognizes the factors of purchasing, stores handling and hauling, engineering and other general expenses that are too often forgotten, but have nevertheless to be met. Many of the cost figures on rural extensions that have been given in various meetings and publications ignore these factors completely.

Objections have been raised to the rules because they give to the utility property showing no value on its books that in later years, when large networks have been built up, will prove embarrassing in property and rate adjustments. Provision has been made to care for this in the Wisconsin Accounting System. The commission has pointed out that the problem of the moment is one of financing, which must be done at the lowest possible rate if at all. Future financing will undoubtedly be determined by the development of the business. Adjustment to changing conditions should not be a difficult problem if utility records are properly kept.

In general the rules are on trial. No one feels that the final answer has been reached. It is felt strongly that the principles upon which they are based are sound and that, pending experience which will clarify their language and development, they furnish a safe guide to prevent major errors and permit ready correction of minor ones. The latter are undoubtedly present but not visible because of lack of experience that enables operators to detect them.

The data on which the 10 per cent return on the cost of extensions is based is too meager to allow confident assertion of its sufficiency, therefore those engaging in rural service work under this plan should concentrate their efforts on the collection of data bearing on the subject. Arrangement of accounting methods to show these costs accurately from year to year is a necessary step in the study as well as means of collecting and tabulating data on ways and means of handling maintenance.

Mines Versus Tidewater as Locations for Super-Power Stations

A NUMBER of reasons have been advanced by George S. Rice, chief mining engineer of the Bureau of Mines, for the location of super-power stations at the mines rather than at tidewater. Since the whole matter of super-power in the Boston-Washington area is now under study, Mr. Rice has given out the following statement of his views:

"There is no difficulty whatever in finding suitable locations in the North Appalachian coal fields so far as grouping mines is concerned. The coal requirements could be satisfied in any one of the following localities, where abundant coal resources can be found for a period of seventy-five or a hundred years within a distance of 20 to 30 miles of the respective points:

"Anthracite District of Pennsylvania.—Wilkes-Barre, on the Susquehanna River, 100 miles from New York; Mauch Chunk, on the Lehigh River, also 100 miles from New York.

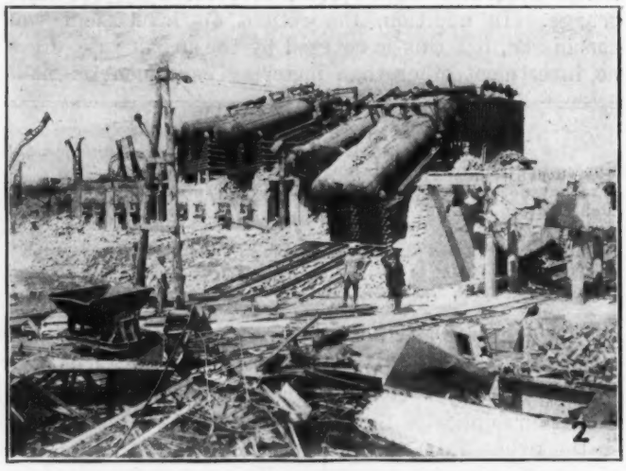
"Bituminous Field of Central Pennsylvania and Maryland Fields.—Mount Union, on the Juniata River (Broadtop field tributary), 150 miles from Philadelphia; Clearfield, on west branch of the Susquehanna River, 180 miles from Philadelphia; Tyrone, on the Juniata, 160 miles from Philadelphia; Johnstown, on the Conemaugh, 195 miles from Philadelphia; Cumberland, Md., on the Potomac (Myersdale and Somerset, Pa., and Cumberland field tributary), 110 miles from Washington, D. C.

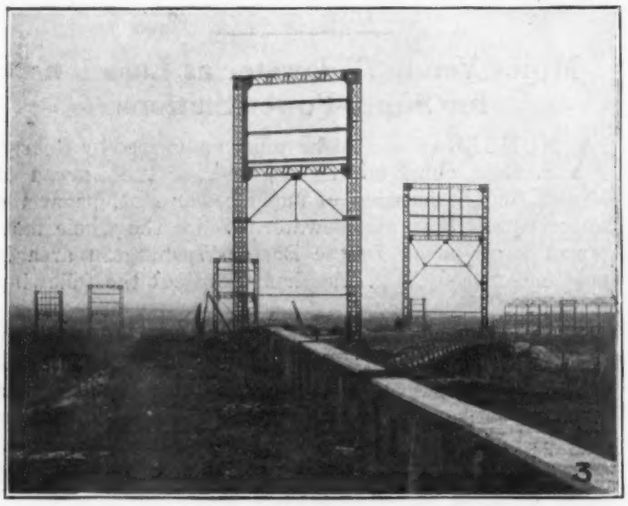
"West Virginia Field.—Fairmont, W. Va., on the Monongahela River, 170 miles from Washington, D. C.

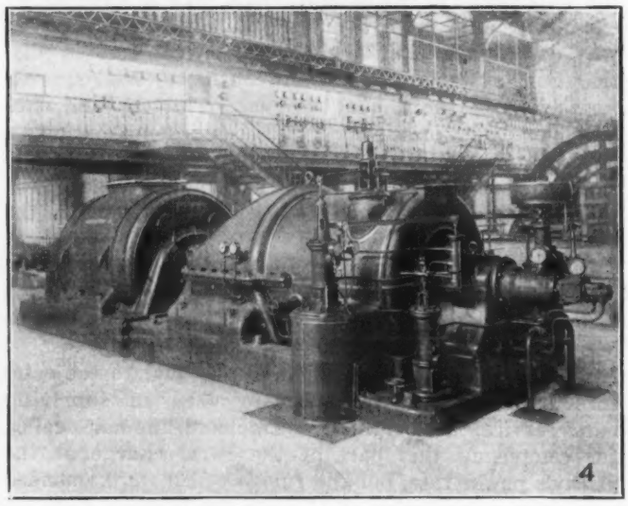
"The size and character of super-power plants in these districts will, therefore, be determined by the water conditions which may be developed rather than by the coal conditions.

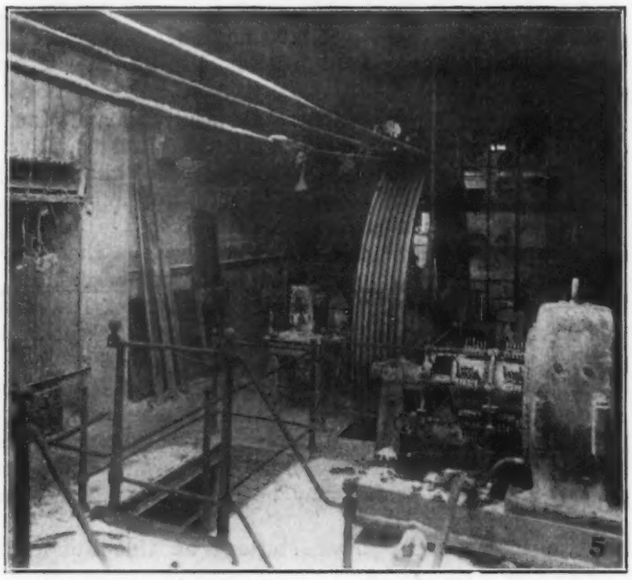
"To locate super-power stations at tidewater will mean long railroad hauls over mountain grades, except on coal hauled from the anthracite field, and distances by railroad of from 150 to 300 miles, and it means the hauling over railroads already crowded to capacity and through congested terminals. It seems evident from recent experience in obtaining fuel, both in the East and the West, that the trouble arose not because of any shortage at the mine but through lack of rail capacity.

France Is Rapidly Restoring Electric Systems Destroyed During War









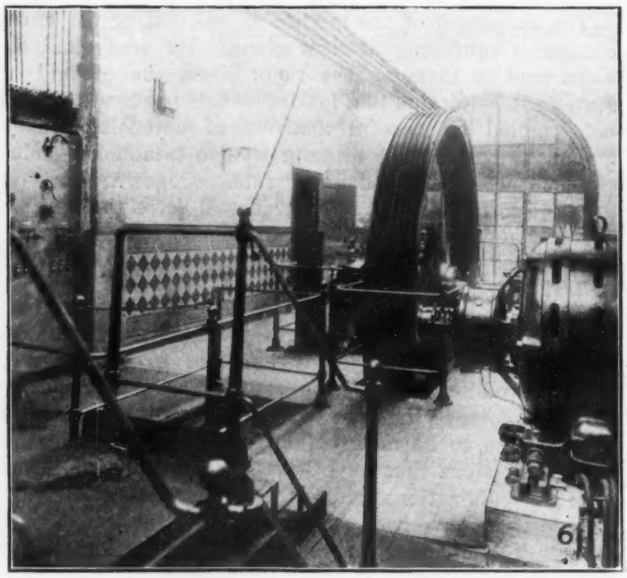


Fig. 1—Compagnie Electrique du Nord, at Beautor, Department of the Aisne. This shows what war did to a 14,000-kw. central station between Soissons and St. Quentin.

Fig. 2—Same plant as in Fig. 1. The reconstruction and salvage under way early in 1919.

Fig. 3—New transmission-line towers for the lines from the station shown in Figs. 1 and 2. The French government network program includes lines from here at 45,000 volts or 65,000 volts, one to Rheims and one to Hirson. Destroyed lines to St. Quentin and other places are being rebuilt.

Fig. 4—Compagnie des Tramways de Lille. The turbo-alternators as well as the boilers were taken away. This view shows the plant once more in operation, Feb. 2, 1920, with a 3,000-kw. Swiss generator in the foreground.

Fig. 5—Engine room of an industrial plant. View taken Feb. 3, 1919, showing the results of bombardment. Note the snow from lack of roof, the few relics of the stolen switchboard and the continuous-current generator.

Fig. 6—The same engine room as in Fig. 5, but taken on Feb. 14, 1920. This shows the reconstructed plant in actual operation, with a new switchboard and an alternating-current generator having directly-connected exciter.

Rebuilding France and Belgium Electrically

Extensive Electrification of Railroads and Industries Included in Reconstruction Plan—Partly Destroyed Central Stations Rapidly Resuming Operation

BY OLIVER FIELD ALLEN
Formerly Major of Engineers, A. E. F.

THE war had been going on less than nine months when the French, in May, 1915, began to think of reconstruction. On May 12, 1915, the Chamber of Commerce of Paris stated that the government must prepare to furnish to the devastated regions as soon as they should demand it tools and equipment, much more useful than an indemnity in money, to insure the immediate resumption of work. The matter was studied during that summer specially by the industrial organizations which had existed before the war, and on Sept. 8, 1915, an organization was created by a committee composed of representatives of the various trades in the invaded regions.

One of the first problems studied was the replacement of the destroyed and stolen electric plants and transmission lines. The investigators realized that power plants must be tied together to exchange surplus energy. It was agreed to make three-phase, 50 cycles, the standard for all electric service except the electrification of steam railways, for which 1,500 volts, continuous current, has since been adopted. Ordinary distribution systems for lighting and small power are at 3,000 volts. Main transmission and power systems are from 5,000 volts up to 120,000 volts, according to size and distances. A rating of 5,000 kw. was selected as one generally applicable to turbo-generators, and several units of that rating were ordered from French builders in 1917. A few were installed in 1918.

By 1917 the extensive use of electric power in war became general, and the first part of 1918 found the French and the British services closely co-ordinated, electrical energy being available along the entire line of the western front.* Many miles of transmission lines had already been built behind the lines. Central-station and industrial power plants had been interconnected, and in some cases augmented by additional units. There were, in addition to the little portable gasoline sets, used by the hundreds, and the big stationary plants of the S O S., 50-kw. power plants installed on freight cars, which could be left on sidings near places where more energy was required. Army electrical construction is being used as far as possible for peace-time work. The woodworking establishment of the American army concrete factory, for instance, with its 5,000-volt transmission line, substation and motor-driven tools, all installed by our army engineers, is now busy building wooden parts for houses for the reconstruction. The 100,000-volt transmission line from Switzerland to the northern edge of the Department of the Vosges, started in 1918 by the Service Electrique to give more energy to the armies to be massed before Metz, has been completed by civilian enterprise.

The need for a comprehensive distribution system and for the greater use of electric motors was fully appreciated and the problem studied with a thoroughness surprising in view of the attention which had to be given to day-to-day war needs. While the Germans were at the very gates of Paris the officers of the Service Electrique and the technical men of the big electric companies, with the engineers of the Comptoir Central d'Achat, were planning a great high-tension network for the frontier departments which had been devastated. This developed into a project covering the vast industrial and mining areas from Switzerland northwest through Alsace and Lorraine to Briey and Longy, across the Ardennes, and up through the Nord to Lille, with a main line from the center of the mining district, near Lille, down to Paris, involving hundreds of miles of transmission lines to be built by the French government. They will be the main arteries of the great system and tie together the existing and future local networks. According to the original plan about one-half will operate at 120,000 volts and the rest at 45,000 volts and 65,000 volts. The program for the power houses has now been expanded to include several very large central stations, each of more than 60,000 kw. capacity. By the end of 1919 there had actually been constructed 110 km. (68 miles) of these government lines, and 290 km. (180 miles) were under construction.

The government is carrying on a campaign of education in regard to the greater use of electricity. In a bulletin issued in November, 1919, by the Ministry of Industrial Reconstruction, called "Electrifiez-vous" ("Use Electricity"), after commenting on the large amount of coal imported into France even before the war, the slowness and difficulties of the renascence of the coal-mining industry and the greater thermal efficiency of the large central stations as compared with most factory plants, the following words appear: "The purchase of energy from these networks will result in an important economy of fuel for the entire country."

Some of the accompanying photographs show a little of the destruction of central-station buildings wrought by shell fire, machine guns and bombs. Much of the most valuable equipment was stolen and taken to Germany. The same thing was true of the industrial plants, especially of the steel works, and of mine surface machinery. In the great metallurgical works of both France and Belgium not only were the generating units, and sometimes the boilers, taken but virtually all of the motors. Happily much of this loot has been recovered. The best-informed managers state that its average value is about 50 per cent of its pre-war value.

Allied electrical manufacturers have had to make apparatus and auxiliary equipment to work in connection with that of German manufacture to an extent never dreamed of before the war, for a large part of the electrical machinery of all kinds in the mining and metallurgical establishments of France near the frontier, as well as in Belgium, was of German manufacture.

The situation in Belgium has been very much the same as in France in regard to electrical matters, except as to long transmission lines. Belgium is fortunate in having a large part of her great industries which require power very near her mines. She has been able to resume coal production much faster than France because destruction in her mines was almost entirely confined to the surface works, while in France the shafts and galleries were blown in and flooded. But the Belgians also realize the necessity for fuel economy and are perhaps even more alive than the French to the value of motor drive for increasing production.

*See "Army Electrical Work in the Advance Areas in France," by the author, in *General Electric Review*, August, 1919, Vol. XXII, No. 8.

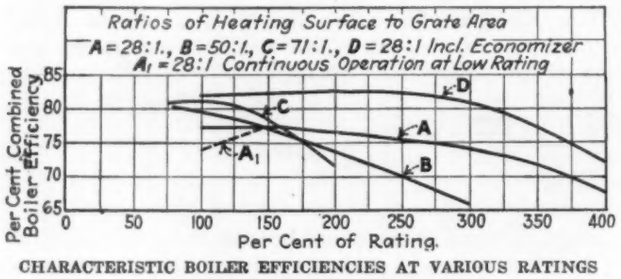
The Effect of Boiler Ratings on Furnace Maintenance

Desirable Ratings and Areas for Industrial and Central-Station Loads—Operating and Design Conditions Which Make for Low Maintenance Cost

BY THEODORE MAYNZ
Efficiency Engineer Cleveland (Ohio) Electric Illuminating Company

THE rating at which boiler units should be driven or for which they should be designed depends primarily upon the load characteristic of the plant and upon the cost of the fuel. To determine the best rating an analysis of the steam-demand curve should be made, a test efficiency curve of the complete boiler unit should be plotted, and from the cost of the fuel for various ratings the lowest total production cost should be determined. Having determined the rating for lowest cost of energy the boiler units should be designed or modified to obtain a minimum cost of maintenance.

In industrial plants with steady loads boiler units designed to operate at approximately 125 per cent to 150 per cent of rating will probably produce the cheapest power. Should the load vary greatly and the peaks exist for six or eight hours, moderately high ratings of about 200 per cent to 250 per cent, and even 300 per cent with economizers, will produce the lowest total power cost. In plants where the steam demand varies, for example, from 20,000 kw. to 100,000-kw. peaks of short duration, few units operated at extremely high ratings during the peak loads will produce the cheapest power, even though the boiler efficiency may drop to 65 per cent or 60 per cent.



CHARACTERISTIC BOILER EFFICIENCIES AT VARIOUS RATINGS AND WITH DIFFERENT GRATE AREAS

These curves are for Babcock & Wilcox boilers of different types and sizes equipped with underfeed stokers and with widely differing ratios of heating surface to grate areas.

When boilers are forced considerably above their normal rating, the efficiency of the unit decreases, but the point of maximum boiler and furnace efficiency can be varied considerably by changing the proportion of grate area to heating surface. The curves published with this article show distinctly how the efficiency is increased at low ratings by an excess of heating surface, while the over-stokered boilers are more efficient at high ratings. A point to be considered is that it is extremely difficult to operate stokers at very low combustion rates, so that though tests may show high efficiencies at low ratings on over-stokered boilers, normal operation has shown that this is not maintained (see curve A-1). The grate area is also influenced by the character of the fuel, as the use of a high-ash fuel necessitates a larger grate area than is required with a low-ash fuel. The ratios of heating surface to grate area vary from about 75 to 1 to about 28 to 1. If properly applied, the higher of these ratios would indicate the use of expensive low-ash fuel, boilers normally operated at from 100 per cent to 125 per cent rating, and a constant steam demand.

The economizer and boiler curve D when compared with curve A shows how the economizer increases and maintains the combined boiler efficiency over a large range in load. The rise in flue temperatures due to higher ratings cannot be avoided, and thus far economizers are usually installed when boilers are to be operated at ratings of 250 per cent or more.

The draft loss through the boiler setting increases slightly more than the square of the rating, so that the draft loss at 400 per cent would be a little more than sixteen times the loss at 100 per cent rating. Obtaining chimney draft to remove the gases at ratings in excess of 200 per cent involves extremely high stacks, so that even if economizers are not used, induced-draft fans are usually necessary. These increase the fixed and operating charges.

Both banked and reserve boilers are uneconomical and entail additional first cost and fixed charges for building, boilers and stokers, but provision should be made, especially if the units are few in number, to carry the load if one boiler should have to be taken off the line on account of trouble. In every plant there should be a sufficient number of units to permit maintenance and repairs to be made thoroughly without any loss in steam output. A fair way to determine how many extra boilers a plant should have for twenty-four hour service is to take one boiler plus 10 per cent of the number of boilers required to carry the load. As an example, if the load requires a maximum of eight boiler units operating at, say, 200 per cent rating, there should be ten boilers installed. However, the draft, chimney, flues and stokers should be designed to allow seven boilers to carry the load; that is, on a basis of a maximum of 230 per cent rating on each unit.

Maintenance of boiler, stoker and furnace at high ratings is a serious problem. The maintenance of the boiler itself is dependent upon the quality of the feed water, so that for continuous ratings above 200 per cent to 250 per cent the make-up water must be distilled or treated, preferably the former. Raw untreated water should not be used, even though the same water has been successfully used at lower rates of evaporation. With distilled or correctly treated make-up water, thoroughly systematic boiler cleanings and inspection, the boiler maintenance cost should be the same per 1,000 lb. (450 kg.) of steam produced at all ratings.

The brickwork maintenance increases with the combustion rate, but if the furnace is properly designed and installed, this will not be the limiting factor. A furnace will not last so long at high rating as at low, but a boiler unit whose stoker and furnace is designed for a high output will be much cheaper to maintain than one that was originally designed for moderate outputs and is then forced. The latter condition is the reason for the prevailing opinion that high ratings are extremely destructive to furnace brickwork.

Stoker maintenance is dependent upon the tons of fuel fired. If stokers are designed to maintain high boiler ratings so that the fuel consumed is held to the moderate combustion rates of 50 lb. or 60 lb. of fuel per square foot (250 kg. to 300 kg. per sq.m.), and if there is sufficient draft to eliminate all pressure in the furnace so that the gaseous products of combustion are removed as fast as generated, the stoker maintenance will then be normal.

Maintenance Problems and Solutions

Some Outstanding Problems of the San Joaquin Light & Power Company in Connection with Water and Steam Generating Equipment Are Discussed—Control Systems, Insulator Troubles and Distribution Transformers Are Touched On

By E. A. QUINN* and R. C. DENNY†
San Joaquin Light & Power Corporation, Fresno, Cal.

ON ANY electric power system where steam plants form a large part of the output inspection and upkeep of these steam plants are quite as important as any maintenance work on the system, for, if neglected, the greatest hazard to continuous service is incurred, economy of operation is affected, and considerable expenditure is often made necessary. Moreover, this is a phase of maintenance that is difficult to accomplish, as very often these steam plants are required to be on the line continuously for many months at a time. This observation refers to the main units themselves, their condensers and other important auxiliaries that are not provided in duplicate. Turbine troubles may be made evident from outside indications, such as a rapid rise in temperature, while still maintaining a good vacuum, or from the rubbing of buckets causing excessive vibration. Reduction of efficiency may be caused by leaky packing glands, due to low water pressure or to low steam pressure on carbon packing if of that type; in fact, this is quite a common, although not a serious, trouble. Loss of blading is probably more common in turbines operating on extensive high-voltage transmission systems on account of the many short circuits encountered.

Causes of Turbine Blading Failures

The drawing of "slugs" of water over from the boilers into the turbine may give trouble as this sometimes happens during a short circuit on account of the sudden tremendous overload forcing the boilers. It is prevented to a great extent by the use of superheaters, but not in all cases. Another cause of blading trouble is the admission of high-pressure steam to the intermediate stages by the auxiliary valve during a short circuit. This is often serious, and the opening of the auxiliary valve should be somewhat limited and no attempt made to keep the unit up to speed beyond a reasonable overload during a "short." On clearing a "short," with the usual resulting total loss of load and often before normal operation can be resumed, while still maintaining a vacuum, the turbine is subject to serious overheating from windage. This may be prevented by connecting a small steam line with the turbine and using it at such times. Any turbine that has been kept continually in service and subject to short-circuit strains for several months should be opened up for inspection when the system load will permit. Very often worn or broken blades are detected on such examinations, and if these are removed and replaced by new ones, whole stages may be saved, or insufficient clearances may be revealed, the correction of which will prevent the rubbing and possible damage of thousands of dollars' worth of blading.

Condenser troubles where cooling water is drawn from irrigation ditches or ponds are very often due primarily to leaves and vegetation stopping up the tubes. This results in a low vacuum and a hot condenser, and after a few such occurrences the tubes begin to leak. This can be prevented only by the use of trash racks or screens and by employing sufficient reliable labor to keep them clean.

In oil-burning steam plants, or where oil is used as a stand-by in gas furnaces, the inspection and care of the burners and oil-piping system is of utmost importance.

SAN JOAQUIN LIGHT & POWER CORPORATION
INSPECTION REPORT OF SUBSTATIONS

Station_____ Date_____ 191__

Temperature of Air_____

Transf.	Gaskets	Temp.	Oil Level	Oil Test	Terminals	Case Ground
No.						
No.						
No.						
No.						
Potential						
No.						
No.						
No.						

Load on Station_____ K.W. Voltage_____
_____ K.W.
_____ K.W.

Grounds: Station_____ Apparatus Grounds_____

Switches	Oil	Oil Level	Grounds	Auto Trips	Disconnects
No.					
No.					
No.					
No.					
No.					
No.					

Air Switches. 60 K.V. No._____ Lightening Arresters 60 K.V._____
30 K.V No._____ 30 K.V._____
10 K.V. No._____ 10 K.V._____

Insulators: 60 K.V._____
30 K.V._____
10 K.V._____

Meters:

Graphics		Indicating		Integrating	
No.	No.	No.	No.	No.	No.
No.	No.	No.	No.	No.	No.
No.	No.	No.	No.	No.	No.

Telephones:
Fuses_____ Bleeders_____ Magneto_____ Batteries_____ Spark Gap_____ Ground_____
Gereral:
Conditions of Buildings:
" Roof:
" " Poles, Cross-Arms Etc:
List of Supplies on Hand:

(Remarks over) Inspector

FIG. 1—SUBSTATION INSPECTION REPORT FORM USED BY SAN JOAQUIN LIGHT & POWER CORPORATION

The strainer in the oil system should be watched closely and not allowed to become clogged. They are generally arranged for blowing out with steam, and a pressure gage each side of the strainer will indicate any stoppage. In regard to the burners themselves, complicated burners should be avoided, as there are simpler ones on the market with fewer parts that are just as efficient and more satisfactory from an operating standpoint. The burner plates are subject to the most wear and they should be inspected often and changed, otherwise they will cause uneven fires, with resulting loss in efficiency and furnace troubles. New burners should be kept on hand and in order, to replace clogged burners.

*General superintendent. †Operating engineer.

Probably the greatest cause of reduction in boiler efficiency is the formation of scale. This can be controlled by treating the feed water and should not cause much trouble in a modern condensing plant. Condenser leaks are sometimes responsible for this in otherwise well-regulated systems by allowing the cooling water to get into the boiler water. Tests should be made on the boiler-feed water occasionally, and once a month the boilers should be examined, not only for scale but for leaky settings, baffles and burned or cracked firebricks. Burning and cracking of the furnace walls can generally be ascribed to forcing the fires too hard or to uneven fires, and possibly to burners becoming turned to one side. Cracks should be repaired with plastic cement. Gas fires give little or no trouble in this connection; neither does the gas fire cause any soot deposits.

Maintenance of hydraulic apparatus in water-power plants, while of great importance, does not assume the significance of steam plant upkeep. The moving parts of hydraulic apparatus are generally so massive that years of service will result in only slight reductions in efficiency. This depends a great deal upon the pressure head and whether the water carries much silt or sand;

Form 1180

Tester_____ Date_____ 19____

Power_____ Gas_____ Routine_____

Lighting_____ Demand_____ Complaint_____

Day	Not Recording	Below 90 %	90 95	95 98	98 99	99 100	100	100 101	101 102	102 105	105 110	Above 110
Mon.												
Tue.												
Wed												
Thur.												
Fri.												
Sat.												
Total												

FIG. 2—METHOD OF RECORDING METER ACCURACY

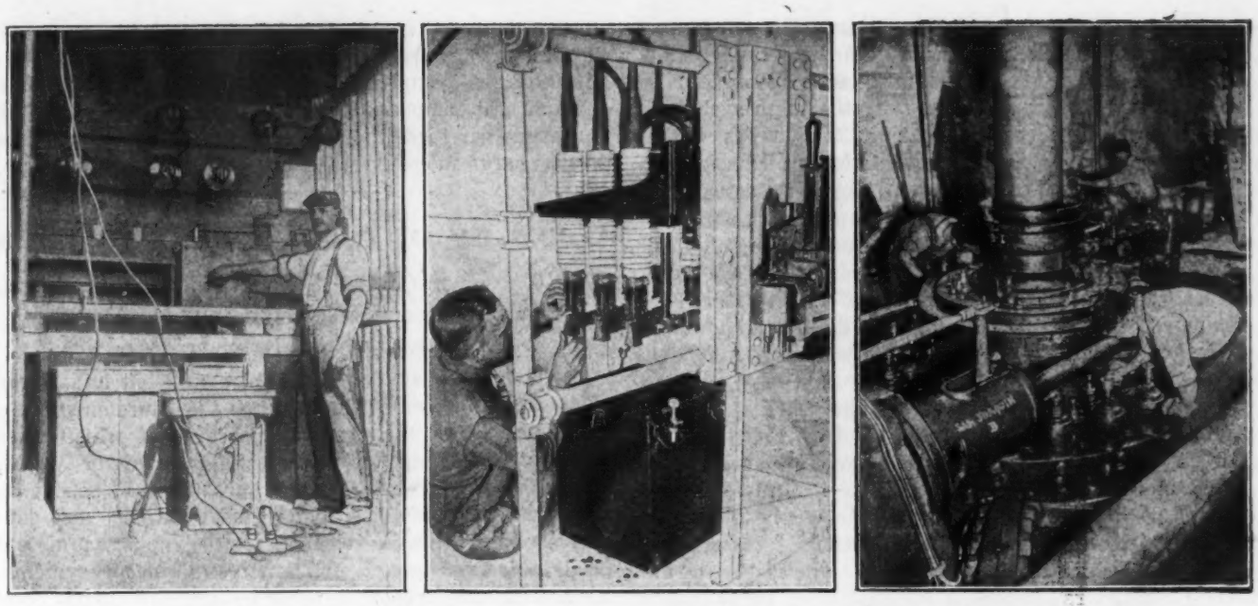
also upon the material of which the runners or buckets are made. Bronze runners operating under a few hundred feet head have been known to wear thin enough to fail completely within three years, while bronze buckets operating at more than a thousand feet head have been in service for ten years. In the one case no sand traps or settling basins were in use, while in the other both methods were used and with great apparent success. Sand is also very destructive to the main needle and nozzle, necessitating frequent replacement of needle tips and throat rings.

In hydro-electric plants having Venturi meters in the penstocks or other accurate means of measuring the water used it is very easy to keep an every-day check on the over-all plant efficiency, and knowing the electrical efficiency to be high and fairly constant, the decrease in hydraulic efficiency can thus be observed. The inspection and maintenance of hydraulic relief valves is highly important, as failure to operate during times of trouble might result in bursting the main pipe line. The water supply to the relay valve of the relief valves is always run through a strainer, and this should be inspected often and kept clean; otherwise the relay valve tips and seats will be cut out and affect the operation of the valve. The relief valve should be opened once a day by hand to note the time of closing. It should be entirely closed as slight leaks will cause cutting of the main piston and seat, or if obstructions cause it to remain open considerably, much water will be wasted. Little trouble is experienced with governor connecting rods or with gate arms and links or shift rings if close attention is paid to turning down grease cups and keeping all packings tight.

There have been several generator burn-outs that have been difficult to account for; that is, failures under absolutely normal operating conditions and with no overload. It is a certainty, however, that in no case was the trouble due to clogged ventilating ducts or to vibration of coil ends. Probably in one or two cases of old generators the trouble was due to deterioration of the coil insulation, inasmuch as the same units are operating in a perfectly satisfactory way with new sets of stator coils and even overloaded. Another case was suspected to be caused by field-coil trouble and loss of excitation, subjecting the stator to short-circuit current and breaking down of coil insulation. Other cases of generator failures are known to have been due to lightning and to high voltage during runaways puncturing the coil insulation. This last-mentioned difficulty can be overcome by the use of a high-voltage cut-out relay in connection with the voltage regulator. There is little protection from lightning where overhead circuits are fed directly from the bus at generator voltage. It was found advisable for this reason to change one or two such circuits to operate at a different voltage, and the necessary intermediate transformers have resulted in adequate protection. The insulation resistance of generators should be "meggered" once or twice a year, or more often, on units that have had particularly severe strains.

Little trouble is experienced in the operation of control systems. Fuses blow occasionally during trouble, probably because of induced disturbances, but cause no great inconvenience. All relay and operating contacts are cleaned at least twice a month and as a result give no trouble. In most cases control systems are operated from separate direct-current generators but are arranged to be switched to exciter buses instantly on necessity.

In the thirteen generating plants and forty-odd substations there are about 400 oil switches, ranging in voltage from 2,300 to 110,000, to be inspected and maintained. This constitutes probably the largest maintenance problem, because it is as extensive as the system itself. In the generating plants this work is taken care of by the chief operator. The substation inspection and repairs are handled by eight men who are constantly on the move from one substation to another in their divisions. In general the arrangement of the oil switches and paralleling buses is such that almost any switch may be taken out of service for inspection and repair without interruption to the circuit that it serves. A large majority of the switches are automatic and quite frequently operate to break considerable over load current. This results in burning and blistering of contact fingers and blades, which is more noticeable on some types of switches than on others. Those having arcing tips in connection with the main contacts give the least trouble. Blistering and burning of contacts is probably the greatest cause of switch trouble and can be detected and remedied only by frequent inspection and repair, at which times particular attention is also paid to loose contact jaws, blades and supporting



AT LEFT, DISTRIBUTION TRANSFORMERS UNDER TEST. IN CENTER, INSPECTING AND ADJUSTING 10-KV. OIL SWITCH. AT RIGHT, TURNING DOWN GREASE CUPS AND TIGHTENING PACK GLANDS ON 15,000-HP. TURBINE

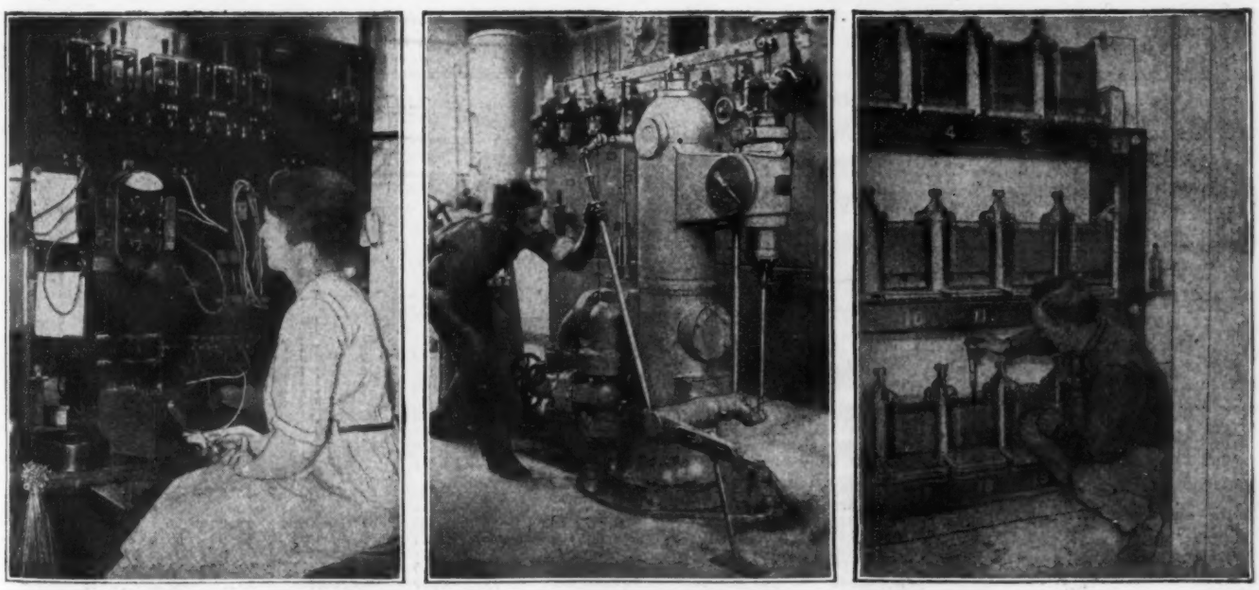
insulators. Bushings and leads are also inspected but never have given any trouble. Oil sometimes leaks from the drain cocks, but this trouble has been prevented by capping them. Oil samples are taken from the switches regularly and tested at headquarters.

All switches are inspected once a month and as a result give very little trouble.

Batteries are not used in the generating stations for tripping switches; however, in the substations they are necessary and storage batteries have been found to be the only reliable battery for the purpose. Ordinary portable automobile-type batteries are used and are carried by the inspector once each month to central points where they are charged by small rectifiers. Several extra batteries are provided in each division and kept charged for replacements.

Probably the greatest source of trouble with distribution transformers is caused by broken or loose bushings causing the leads to be pulled down and "short" on the case inside the transformer. Bare leads are a necessity to prevent the oil creeping up and rotting the insulation. Terminal boards are rarely every primarily the cause of trouble but are often "shot" by lightning, causing a short circuit and burn-out of transformer. Defective insulation and moisture in oil are accountable for only a very small percentage of transformer troubles. All distribution transformers are fused. The blowing of these fuses is generally the first indication of trouble in the transformer, and this leads to an inspection and tests. With the exception of 2,300-volt transformers, all distribution transformers are inspected once each year for mechanical faults; the condition of the oil is also noted at these times and more oil is added when necessary.

The most frequent causes of insulator trouble on the transmission and distribution lines are those over which the company has little or no control. Many insulators are broken by gun shot, some by stones thrown by



AT LEFT, TESTING METERS IN LABORATORY. IN CENTER, ADJUSTING GOVERNOR ON 15,000-HP. TURBINE. AT RIGHT, TAKING HYDROMETER READINGS IN STORAGE BATTERY

children, and quite a few by large birds and water fowl grounding lines to cross-arms and hardware. Probably only about 2 per cent of these happenings ever actually cause service interruption. A very thorough system of patrol of all lines, approximating 3,700 miles (5,950 km.), at least once each month discloses all broken insulators, and those considered likely to cause line trouble are changed at the time. Considerable trouble was experienced with strain insulators puncturing at dead ends and corners. This has been remedied to a great extent by the use of a different type of insulator. No insulator failures are thought to be due to temperature change, although an average daily variation of 80 deg. Fahr. in temperature prevails through the summer months in the San Joaquin Valley, the yearly maximum and minimum being perhaps 140 deg. Fahr. in the sun and as low as 28 deg. on some winter mornings.

The one remaining important phase of maintenance work is the inspection and testing of consumers' meters. This requires an extensive organization of testers and repairmen under expert supervision. The testing of the 34,000 consumers' meters is handled from three points on the system, with the same methods and records.

All meters are of the induction type, 15 per cent being for power purposes and 85 per cent for lighting. Before the war routine tests were made on all meters, covering lighting meters in twenty months and power meters in fourteen months, more than 80 per cent of all meters testing within plus and minus 2 per cent. However, during the war and afterward, owing to labor difficulties, the periods have lengthened to thirty and twenty-two months respectively. This has had its effect on the accuracy of the meters, as only 73 per cent now test within the plus and minus 2 per cent.

In comparing the accuracy of power and light meters as a whole, the latter type shows less error. This is a natural consequence, since the lighting meter operates under more favorable conditions. It is well protected from the weather and is rarely ever subject to vibration. Of the meters registering between plus or minus 2 per cent, the lighting class shows 83 per cent against 67 per cent for the power class. Of the meters registering below 98 per cent, lighting meters show 1 per cent against 7 per cent for power meters.

The record of meter accuracies is compiled from weekly reports made by each tester on a card form. On these the tester enters the tally of the full load (or normal load), using a separate card for routine power, routine light, complaint power, complaint light, routine demand and complaint demand. The demand record is further subdivided into power or light, and from these weekly cards monthly and annual reports are made up.

Growing of Electrical Industries

1917 Census of Central Stations, Electric Railways, Telephones and Telegraphs Indicates Large Increases During Five-Year Period

THE 1917 census of central electric light and power stations, recently issued by the Bureau of the Census, some of the principal features of which were outlined in the Sept. 4 issue of the ELECTRICAL WORLD, is the final installment of that bureau's 1917 report on the electrical industries, which in its entirety also covers electric railways, telephones, telegraphs, municipal electric fire-alarms and police patrol signaling systems. This is the third report of these industries that has been taken in conformity with the requirements of the act of Congress of June 7, 1906.

Table I gives general statistics relative to the four primary electrical industries and Fig. 1 shows diagrammatically the number of employees, capitalization, income, expenses and net income of the electrical industries for 1902, 1907, 1912 and 1917. The relative importance of the four classes is clearly indicated. The electric railways appear to have led continuously in each of the five items with the exception of net income in 1917, when the central electric light and power stations took the lead in this item. This leadership of the electric railways is only apparent on the surface, however, for in 1917 there were 160 plants listed as electric railways by the Census Bureau which did a very large light and power business. It is probable that if the light and power operations of these 160 companies were credited to the central station industry the relations shown in Fig. 1 would be materially changed. The telephone statistics for 1917, 1912 and 1907 are confined to companies or systems having an annual income of $5,000 or more, whereas the statistics for 1902 cover all systems operated primarily for revenue and include a large number of small organizations and rural lines.

TABLE I—CAPITALIZATION, INCOME, NUMBER OF EMPLOYEES AND SALARIES AND WAGES FOR FOUR BRANCHES OF THE ELECTRICAL INDUSTRY

	Census Year	Total	Central Electric Light and Power Stations	Electric Railways	Telephones	Telegraphs (Land and Ocean)	Per Cent of Total: Central Electric Light and Power Stations	Per Cent of Total: Electric Railways	Per Cent of Total: Telephones	Per Cent of Total: Telegraphs (Land, Rail, Ocean)
Number of companies, stations, or systems	1917	10,076	6,542	1,307	2,200	27	64.9	13.0	21.8	0.3
	1912	8,424	5,221	1,260	1,916	27	62.0	15.0	22.7	0.3
	1907	7,612	4,714	1,236	1,636	26	61.9	16.2	21.5	0.3
	1902	7,789	3,620	987	3,157	25	46.5	12.7	40.5	0.3
Capitalization	1917	$9,991,164,215	$3,060,392,141	$5,532,223,818	$1,169,460,470	$229,087,786	30.6	55.4	11.7	2.3
	1912	8,081,223,659	2,175,678,266	4,708,568,141	970,590,442	226,386,810	26.9	58.1	12.2	2.8
	1907	5,830,667,500	1,096,913,622	3,774,772,096	738,688,207	220,293,575	18.7	64.5	13.0	3.8
	1902	3,324,000,034	504,740,352	2,308,282,099	348,031,058	162,946,525	15.2	69.4	10.5	4.9
Number of employees	1917	696,431	105,541	294,826	244,490	51,574	15.2	42.3	35.1	7.4
	1912	582,452	79,335	282,461	183,361	37,295	13.6	48.5	31.5	6.4
	1907	428,765	47,632	221,429	131,670	28,034	11.1	51.6	30.7	6.5
	1902	277,474	30,326	140,769	78,752	27,627	10.9	50.7	28.4	10.0
Salaries and wages	1917	$571,781,197	$95,241,858	$267,240,362	$169,655,066	$39,643,911	16.7	46.7	29.7	6.9
	1912	383,034,528	61,161,941	200,867,052	96,040,541	24,964,994	16.0	52.4	25.1	6.5
	1907	269,229,021	35,420,324	150,991,099	65,009,349	17,808,249	13.2	56.1	24.1	6.6
	1902	160,152,151	20,646,692	88,210,165	36,255,621	15,039,673	12.9	55.1	22.6	9.4
Income	1917	$1,739,664,159	$526,894,240	$730,564,691	$372,501,800	$109,703,428	30.3	42.0	21.4	6.3
	1912	1,200,138,640	302,273,398	579,208,430	253,893,969	64,762,843	25.2	48.2	21.2	5.4
	1907	829,877,604	175,642,338	426,900,952	175,750,446	51,583,868	21.1	51.4	1.3	6.2
	1902	463,982,821	85,700,605	250,526,642	86,825,536	40,930,038	18.5	54.0	8.7	8.8

TABLE II—RELATION BETWEEN CAPITALIZATION AND NET AND GROSS INCOME

Census Year	Central Stations	Electric Railways	Telephones	Telegraphs*
	Per Cent Gross Income Is of Capitalization			
1917	17.2	13.2	31.9	47.9
1912	13.9	12.3	26.2	28.6
1907	16.0	11.3	23.8	23.4
1902	17.0	10.9	25.0	25.1
	Per Cent Net Income Is of Capitalization			
1917	3.3	1.5	5.1	7.8
1912	3.1	1.9	5.3	2.8
1907	3.8	1.8	5.5	4.4
1902	3.5	2.1	5.6	6.1

*Land and ocean.

The proportion which the different items for the telephone and telegraph systems bear to the total for the electrical industries is practically constant throughout the period. On the other hand, there has been in practically every case a steady increase in the relative importance of the central light and power business, and just as certain a decrease in the relative importance of practically all items pertaining to the electric railway industry.

The relations which exist between capitalization, gross income and net income are shown in Table II. Until the last census, 1912-1917, total gross income increased less rapidly than capitalization in the electric light and power industry. In the case of the electric railways the gross income has increased with slightly greater rapidity at all periods, while the relations have been relatively constant for the telephone and telegraph companies. The relation between net income and capitalization is quite different. There has, upon the whole, been a tendency to decrease in all of the industries studied. So far as financial returns in the electrical industries are concerned, the electric railways have constantly been in the worst position by far, followed by the central stations. The public utilities have certainly not been operating under conditions of increasing returns as is maintained at odd intervals.

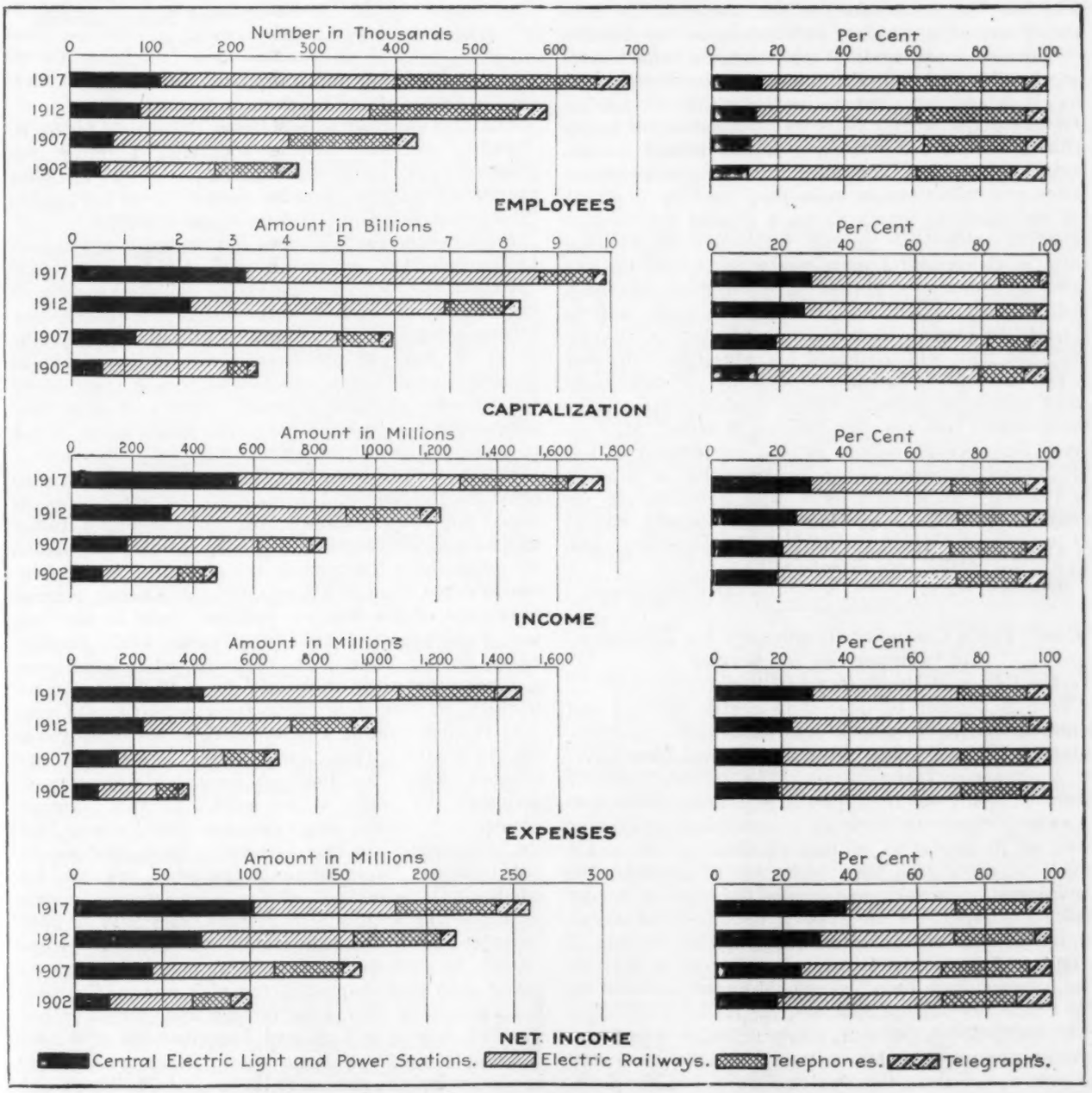


FIG. 1—GROWING IMPORTANCE OF THE CENTRAL STATION IN THE ELECTRICAL INDUSTRY

Readers' Views and Comments

Dr. Butler Turns the Tables

To the Editor of the ELECTRICAL WORLD:

SIR: For a great many years a vigorous and ultimately successful attack was made on the old-fashioned college education, of which Greek, Latin and mathematics formed the triple foundation, on the ground that the results attained were out of all proportion with the effort exerted. It is disheartening to the advocates of the newer studies to have so eminent an authority as Nicholas Murray Butler, president of Columbia University, declare that the criticism once leveled against a classical curriculum can be brought with equal force against the curricula which have largely displaced it. For instance, Dr. Butler says that it is asserted—and he impliedly indorses the assertion—that "for fifty years we have poured out money without stint for the teaching of the natural and experimental sciences and have provided costly laboratories and collections to make that teaching practical, yet the result so far as giving a general command of scientific method or general knowledge of scientific facts is concerned is quite negligible." Dr. Butler's jeremiad contains doubtless only too much of truth, and yet the system and the teachers may not be entirely to blame. Today, as always before, the exceptional man will vindicate his education, whatever it may have been, by his achievements. Today, as always before, no possible college efficiency can change the ordinary into the extraordinary student. If, however, the average culture of the community is less today than formerly, as Dr. Butler seems to think, it is the duty of all concerned with education to reexamine the values apportioned to present-day studies as an engineer would the ratings of machinery from which the output was disappointing.

Brooklyn, N. Y. FRANK W. CHASE.

Court Finds Customer Responsible for Existence of "Jumper" on His Service

To the Editor of the ELECTRICAL WORLD:

SIR: A decision of interest to electric lighting and power companies in general was handed down on Nov. 30, 1920, by Judge Snediker of the Common Pleas Court of Montgomery County, Ohio. The Dayton Power & Light Company has been making strenuous efforts during the past year to break up a practice on the part of some of its customers of tapping ahead of the meter and interfering with the registration of current. The device used to carry current around the meter is usually called a "jumper." When a case of theft is found service is immediately disconnected. In addition to this, a number of customers found using devices to defraud the company have been brought into court, indicted by the grand jury and are now awaiting trial.

In one instance, however, where a jumper was found and service removed, the customer brought mandamus proceedings against the Dayton Power & Light Company to compel it to restore service. At the hearing and also at the trial the company was able to produce two of its own employees and two city detectives as witnesses to the fact that when they called at the house one evening the lights were turned on, the main-line switch was pulled and all the electricity used was passing through a wire around the meter. The plaintiff and his family denied that they had placed the jumper on the service. Nevertheless, the judge immediately handed down a decision denying the prayer of the petition with a severe reprimand to the customer who had brought the proceedings.

The decision is significant inasmuch as it was given in favor of a lighting and power company, although there was no witness to testify that he had actually seen the jumper installed by the customer. The responsibility for the existence of a jumper on his wires is thus placed squarely on the consumer. The decision also sustains the legal right of a utility company to protect itself against consumers who obtain service through fraudulent methods. O. B. REEMELIN,

General Superintendent.

Dayton (Ohio) Power & Light Company.

Lighting and Industrial Accidents

To the Editor of the ELECTRICAL WORLD:

SIR: I have read with interest the article by F. H. Murphy, entitled "Modern Industrial Lighting for Oregon," in the ELECTRICAL WORLD for Oct. 23, and have examined the chart printed on page 820 over the caption "Industrial Accidents Depend Upon Lighting."

Before going further let me say that it is not desired to convey the impression that what may follow advocates the reduction of lighting below a proved safe minimum, but it is hoped that some of your readers may be convinced that the experience of any one company or state does not prove anything definitely. These experiences may point to a tendency, but it is necessary to go further to prove so broad a statement as that the alleged increase of accidents in the dark months is due to a lack of proper lighting.

It is to be regretted that there is nothing under the chart to indicate who furnished this experience. It would help to understand it, for the published statistics available to the writer do not bear out this contention. As establishing the truth of my statement, your attention is called to an article by Lucian W. Chaney, entitled "Influence of the War on Accident Rates in the Iron and Steel Industry, 1914-1919," page 1457, *Monthly Labor Review*, June, 1920. This record is based upon a large number of mills and from 35,000 to 50,000 workers, so that it is fairly representative. On page 1461 of that issue is a table which shows comparisons for 1915-1918. June, July, August, September and October of 1915 are the high months in frequency of accidents per hours of exposure. In fact, January accidents are almost 50 per cent less than those of July, the high month. In 1918 January is the highest month, but October, November and December are the low months. On page 1463 of the same issue is another table showing accidents by months from 1914 to 1919. In 1914 June is the high month, November is the low month. In 1915 August is the high month, January the lowest. In 1916 August is the high month, February the lowest. In 1917 June is high and December low. In 1918 August is high and December low. In 1919 October is high and August low. Other tables might be quoted that are similar to these. J. M. WOLTZ,

Safety Director.

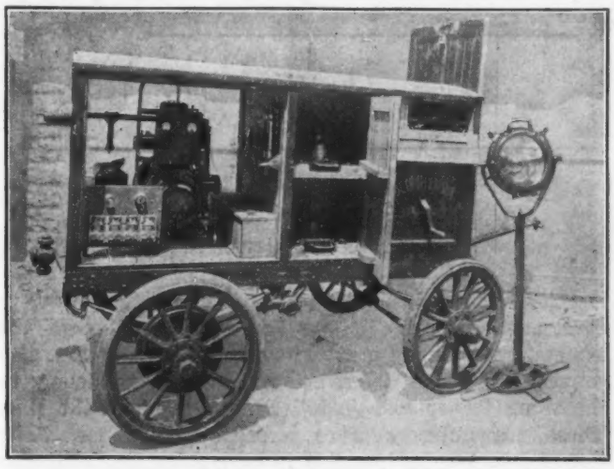
Youngstown (Ohio) Sheet & Tube Company.

Station and Operating Practice

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Portable Generator and Lamps for Outdoor Night Work

FOR lighting work done at night on transmission lines or outdoor substations and similar work a truck trailer has been equipped with searchlamps, extension cables and generating outfit by the Detroit Edison Company. The trailer was made from the chassis of an old electric truck. The generating plant used is a 1-kw. "Delco-Light" portable plant, model 9023, equipped with a 110-volt direct-current generator. It is air-cooled and does not require storage batteries. The fuel used can be either gasoline or kerosene, and by a slight change in the intake valve it can be operated on natural gas. The dimensions of the base



THIS TRAILER CARRIES FOUR FLOODLAMPS AND A 1-KW. GENERATOR FOR NIGHT WORK

are 30 in. x 21 in. (75 cm. x 53.5 cm.) and the height of the engine is 38 in. (95 cm.).

The searchlamps are of the General Electric floodlighting type, having a 15-in. (37.5-cm.) reflector. In use they are mounted on a standard that can be taken apart and placed in a small compartment. Four floodlamps are carried, each mounted in a separate compartment and supported so that no breakage may occur in transportation. A 250-cp. floodlighting lamp is used in each. Extra lamps are carried in a small drawer at the top of the body, each lamp being supported in a socket. Two extra lamps of the gooseneck type are now being made to be clamped on the tops of the poles and reflect directly down for convenience of men working on corner poles or transformers.

At the front end of the body a reel was constructed to carry sufficient wire to extend the lamps at least 1,000 ft. (300 m.) each way from the trailer, which is placed at the most convenient place for lighting the work under way. On the ends of the wire, which is twin-conductor No. 4 stranded, are receptacles. A removable crank extended to the outside of the body enables the wire to be reeled up and conveniently handled. The reel is divided into two sections, one or both of which may be used at a time. At each end of the trailer there are a red light and a license plate. Each section is equipped with removable sides, and when not in use the unit is completely locked up. An inspection is made after use so that the outfit is always ready in case of trouble.

After having built this trailer with the purpose of using it for emergency cases it was found that a great deal of other work could be done at night as conveniently as in the daytime—such as making repairs to outdoor substations, changing transformers and cutting over of transmission lines.

FRED W. BAGNALL.
Detroit Edison Company,
Detroit, Mich.

Rules to Follow During Station Trouble Before Consulting Dispatcher

HOW to handle the situation in case of failure of the alternating-current supply is the subject of an interesting set of rules for the use of its operators issued by the Consumers' Power Company of Jackson, Mich. The theories on which the rules are based are:

1. That operators must do certain definite things preparatory to restoring service.

2. Restoration of service is not helped by communication with the dispatcher, if these things are properly covered by instructions, unless the operator is called or has important information to communicate.

With these two theories in mind a careful study of each station and substation has been made and a definite set of instructions for operators at forty-one points has been worked out. The general rules for operators, applying to all substations, are printed herewith.

RULES FOR OPERATORS TO BE FOLLOWED IN CASE OF FAILURE OF ALTERNATING-CURRENT POWER

In case there are rotary converters or motor generators:
Open all direct-current and alternating-current switches of running machines.
Place alternating-current switches of one machine in starting position and watch for return of alternating-current power.
As soon as alternating-current power is received start machines and restore service in usual manner.
In case there are distribution circuits:
Open all distribution circuit switches and watch for return of power. (The return of power can be determined by hum of transformers, reading of alternating-current voltmeters, lighting of alternating-current lamps and charging of lightning arresters.)
As soon as alternating-current power is received restore service in usual manner or according to special instructions posted.
In case there are both alternating-current and direct-current circuits: (a) Open all direct-current and alternating-current switches of running machines; (b) open all alternating-current distribution circuit switches; (c) prepare and watch for return of power as noted above.
On return of alternating-current power: (a) Restore service to all alternating-current distribution circuits in usual manner or according to special instructions posted. (b) Start machines and restore direct-current service in usual manner.
As soon as service is restored: (a) Make a close inspection of *all* apparatus and note any defects. Pay special attention to brushes, commutators, high-tension insulators, alarm bells, lightning arresters, fuses and meters. Note if broken wedges are around machines or machine band wires are loose. (b) Call load dispatcher or chief operator and report as follows: (1) Service interrupted; (2) time of interruption; (3) duration of interrup-

tion in minutes; (4) cause of interruption if known; (5) damaged apparatus if any.

Operator must notify load dispatcher or chief operator as soon as he is aware of any condition (storm or disturbance) that may affect the service in any way.

Make out "storm or disturbance report" in detail for every storm or disturbance, and if any apparatus is damaged do not fail to make out "damaged apparatus report."

Keep away from telephone during first ten minutes, unless you are called or have important information to communicate. If power is not received at expiration of ten minutes from time of interruption, try to get in communication with load dispatcher or chief operator.

Consider all lines alive until communication is established.

This supersedes all previous rules.

The instructions for a plant that combines generation with transmission-line service are well illustrated by the rules for the operators at the Battle Creek plant, which are as follows:

RULES FOR RESTORING SERVICE IN GENERATING PLANT

(Rules for operations at Elm Street plant, Battle Creek. To be followed in case of trouble on transmission line that interferes with delivery of power.)

(A surge on the transmission line does not necessarily interfere with the delivery of power.)

If the transmission line switches have not opened automatically, start to open them immediately, in the following order, or until the trouble has been cleared:

(a) Open D-4. (b) Open E-5. (c) Open L-12.

NOTE: Immediately prepare to take care of local load. If necessary, cut in additional boilers. If turbines are not running, prepare to get them running. Synchronize with any line as soon as line is energized. If lines are not energized so that you can synchronize, try to energize them as follows:

Try to energize D-4 any time before five minutes have expired from time of interruption. Make at least two attempts to energize this line.

Try to energize the E-5 line any time after two and before five minutes have expired from time of interruption.

Try to energize the L-12 line any time after six and before ten minutes have expired from time of interruption. Make at least two attempts to energize this line.

In all the above cases of closing transmission-line switches stand ready to reopen, should trouble reappear.

Keep away from telephone during first ten minutes, unless you are called or have important information to communicate. Consider all lines alive until communication is established.

This supersedes all previous transmission line rules.

Such rules materially lessen the complication of the dispatching system and leave the dispatcher free to exert his most intelligent efforts in clearing up real difficulties. The story and record of what happened can be procured after the system is back to a normal operating condition.

H. J. BURTON,
Director of Education.

Consumers' Power Co.,
Jackson, Mich.

Life of Cable for Conveying Coal Almost Doubled

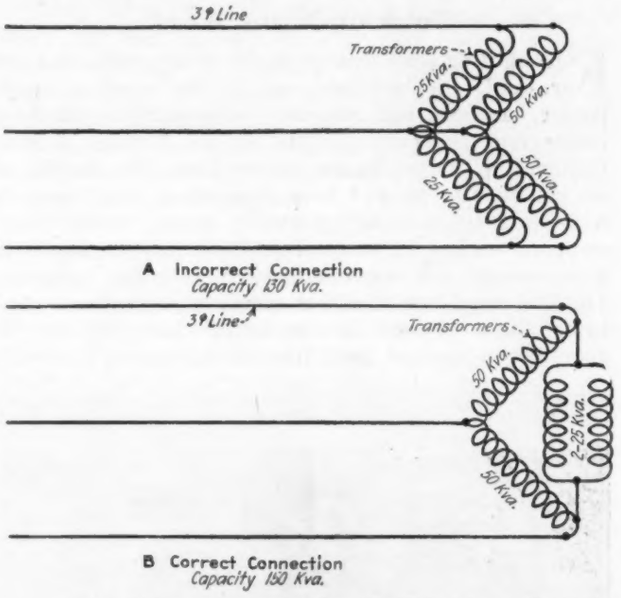
THE life of steel cables and rollers used on cable railways for coal handling has been greatly increased by minor alterations in design on the curves, and principally by changing the roller material and applying guides to reduce friction, in a station of the Philadelphia Electric Company. Previous to this change cables hauled about 30,000 tons of coal before becoming unsafe; the average life is now more than 50,000 tons. The life of the idler rollers was increased from four or six months to eighteen months. These rollers were made of cast iron, in one piece, of the usual spool shape, and weighed about 35 lb. (15.8 kg.) A study by the maintenance section showed that owing to the weight of the rollers the drag of the cable was sufficient to wear but not to turn them. The roller was therefore redesigned to consist of a hollow cylindrical cast-iron wearing piece held between aluminum end disks by through bolts, the whole weighing 13 lb. (5.8 kg.). As a result of the change the rollers turn easily, and when a cylinder wears out, in about eighteen months, it is replaced, using the same end disks, at a cost very small as compared with the cost of a new roller of the original design.

F. C. RALSTON,
Operating Division.

Philadelphia (Pa.) Electric Co.

Connecting Transformers Across Proper Phase Increases Output

A CASE of overloaded distribution transformers which were relieved of their excessive load by simply changing from open delta to closed delta was recently brought to the writer's attention. This was in a small central station where it was noticed that two 50-kva. transformers connected in open delta to supply a power feeder were unusually hot and, in fact, in danger of



INCORRECT AND CORRECT CONNECTIONS OF TWO SETS OF TRANSFORMERS

burning out. It was evident that the transformers were overloaded excessively. On further inspection of the system it was found that two 25-kva. transformers, also connected in open delta, had been added previously to the same feeder and installed further down the line. These transformers were likewise found hot. The transformers were installed in such a manner that one 25-kva. and one 50-kva. transformer constituted a set in parallel across one phase and another 25-kva. transformer and a 50-kva. transformer constituted a second pair across another phase. Diagrammatically the connections were as shown at *A* in the drawing. New transformers were on order, but it was feared that a burn-out might result before their arrival, and something had to be done with present equipment if possible. It was evident that the combined capacity of the two 50-kva. transformers in open delta was not 100 kw. but only 86.7 kva. Likewise, the two 25-kva. transformers had a combined capacity in open delta of only 43.35 kva. instead of 50 kva., bringing about an aggregate capacity of only 130 kva. instead of 150 kva.

Therefore the 25-kva. transformers were disconnected from the feeder and connected in multiple with each other, and this multiple set was connected across the open phase, as shown at *B*. With this combination a closed delta existed and the full capacity of 150 kva. was obtained, an increase of more than 15 per cent. The load on the transformers was still in excess of 150 kva., but there was an appreciable reduction in operating temperature, and the overload was carried satisfactorily.

CORNELIUS G. WEBER,
Electrical Engineer.

Vaughn & Meyers,
Milwaukee, Wis.

Industrial Applications

The Economical Utilization of Electrical Energy
in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

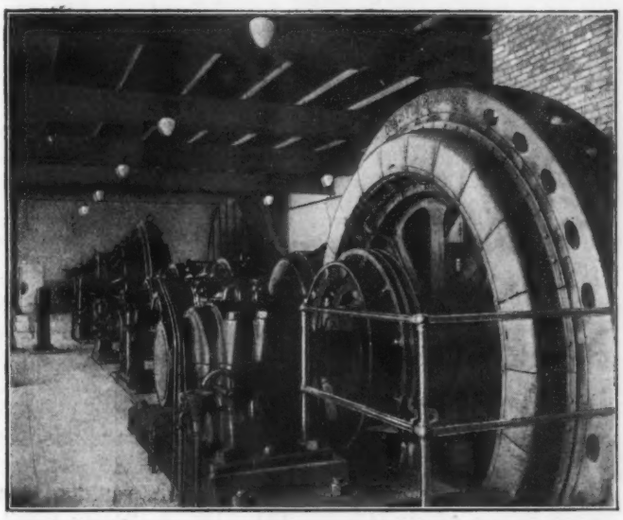
Proper Housing and Ventilating of Steel-Mill Motors

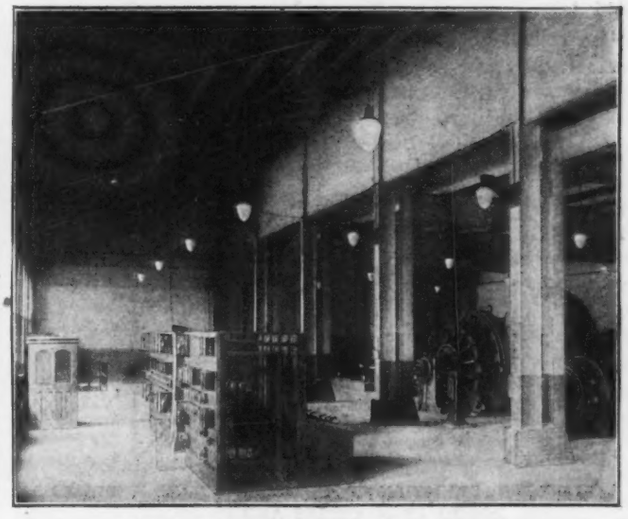
A PROLIFIC source of trouble in steel-mill motors is dust. A test sample of dust taken from the bedplate of a rolling-mill motor contained 81 per cent of good conducting material. It is not surprising, therefore, that such dust tends to impair the insulation of electrical apparatus and reduce the creeping distances. To prevent trouble from this source it has been found advisable to provide motor houses within the mills to protect motor and control apparatus from the dust and gas fumes which attack the insulation. Such a room makes it easier to keep the apparatus clean and to keep unauthorized persons away from the equipment.

One of the most important things to consider in the installation of a motor house is to make certain that the air for ventilating purposes is taken from a clean source. In every case the motor room should be completely closed off from the mill, and where clean air is not directly available an air duct and blower should be used to obtain it. Frequently it is not possible to obtain clean air in the vicinity of a steel mill so that ventilating systems are usually provided with air washers. The amount of air necessary to ventilate a motor depends upon its electrical losses. It is best to have the manufacturer specify the amount of air necessary, but as a general rule about 10 cu.ft. per minute (4,700 cu.cm. per second) per rated horsepower will be sufficient.

In laying out the ventilating ducts care should be taken to avoid sharp turns as these seriously interfere with the passage of air. The ducts should be made as straight as possible and of such dimensions that excessive air velocities will not be encountered. Velocities in the duct of about 2,000 ft. per minute (10 m. per second) have been found very satisfactory.

It is advisable to provide two air intakes—one arranged to take air from the inside of the motor room, the other from the outside of the building. This arrangement is necessary since in the winter air taken from the outside may carry snow and ice into the windings and if an air washer is used it may become clogged with ice. The arrangement suggested permits all or a part of the air to be taken from the inside of the motor room during winter weather. It is best to proportion the amount of air taken from each source so that the temperature in the duct will not be below 50 deg. Fahr. (10 deg. C.). A double door or shutter arrangement should be provided so that in closing one of the intakes the other will be automatically opened. This type of door will prevent the possibility of depriving the motor of its ventilation and will serve as a damper for properly proportioning the amount of air taken from each source.





MOTORS AND CONTROL PLACED IN ROOM SEPARATED FROM STEEL ROLLING MILL

The motor room should be designed with sufficient openings to provide free outlet for the incoming air so that a pressure will not be set up in the room. If the influx of air is opposed by a back-pressure in the room, the amount of air to the machines will be diminished. A good plan is to install exhaust fans near the roof with sufficient capacity to expel the same amount of air as is forced in by the blower.

Sometimes it is not convenient to install a motor house, as, for instance, in a hot sheet mill. In cases of this kind some operators have placed inclosing covers on the motor and have provided a ventilating duct, blower and air washer as described above to blow air directly into the motor.

O. NEEDHAM,
Westinghouse Electric & Mfg. Co. General Engineer.

Separating Hysteresis and Eddy Current Losses in Iron

THE standard method followed for the determination of iron losses consists in measuring with wattmeter and alternating current of a given frequency and at certain maximum flux density the losses in a sample dynamo plate. When it is desired to separate hysteresis and eddy-current losses, such measurements are made at several frequencies or several values of maximum flux density. It is convenient to choose two frequencies such that one is just twice the other, for instance, 50 cycles and 25 cycles. The hysteresis losses for the higher frequency then are just twice, the eddy-current losses just four times, the corresponding losses for the lower frequency, and the two items may be easily separated by solving a simple system of equations. The separation, however, may be still more simplified by the use of an abaque, or alignment chart, designed by A. Joitel and described in the *Revue Générale de l'Electricité*. If for a given induction the total losses at 50 cycles and 25 cycles respectively are read off the corresponding scales *W*50 and *W*25, and a straight line is drawn joining the two readings, then the intersections on the two other scales *F*50 and *H*50 will give the 50-cycle eddy current and hysteresis losses respectively in the sample.

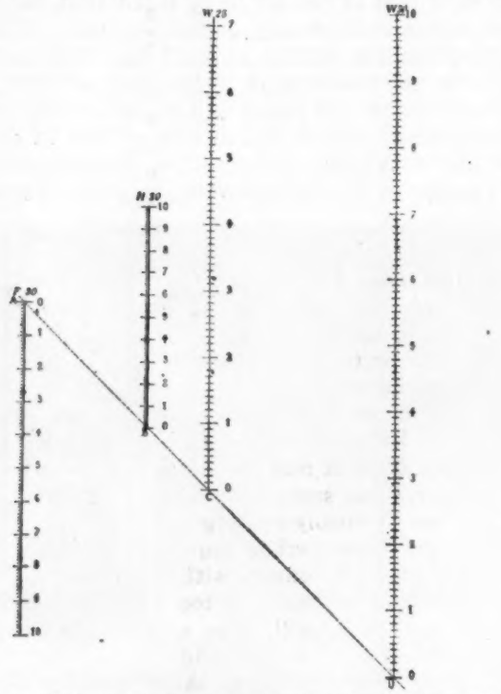


CHART FOR SEPARATION OF EDDY CURRENT AND HYSTERESIS LOSSES AT 50 CYCLES AND 25 CYCLES

The chart may be used also for separation of losses if the measurements were made not at 50 cycles and 25 cycles, but at any other two frequencies which are in the ratio of two to one, and they will then give the separated losses at the higher frequency. If losses are measured in watts per kilogram, the scales will be found to cover most cases which occur in practice. An alternative method consists in measuring the total losses at a given frequency but different values of maximum flux density. A second abaque is presented for separating the two kinds of losses in such a case. Incidentally the same chart may be used for determining the exponents, which in practice seldom take their theoretical values, respectively 1.6 and 2.0. Besides these two analytical charts, an alignment chart is given from which, knowing the separated losses at a given frequency, the total loss at any other frequency may be picked out without computation. Some interesting methods of separating the losses by graphical analysis of experimental loss curves are also described.

Changing Speed of Squirrel-Cage Motor Without Changing Horsepower

CHANGING the speed of a three-phase squirrel-cage induction motor from 900 r.p.m. to 1,200 r.p.m. without affecting the horsepower was accomplished recently by reconnecting the winding to give six poles instead of eight. The motor was rated at 75 hp., 440 volts, 60 cycles, three-phase, 900 r.p.m., eight poles. The orders were that the motor was not to be rewound, nor was the horsepower to be changed. A reduction in the starting torque was allowable as the motor was started satisfactorily on the 50 per cent tap of the auto transformer, and this could be changed to a higher tap if necessary. As received the motor had ninety-six slots and ninety-six coils in a two-layer winding connected series-delta in twenty-four groups, four coils in series per group with a pitch of 1 and 11. Full pitch for the eight-pole winding was 96 slots ÷ 8 poles = 12 slots. A pitch of 1 and 11 gave a span of (10 ÷ 12) × 180 = 150 electrical degrees, and a chord factor of sin (150 ÷ 2 deg. = 0.966. For the six-pole connection full pitch would be 96 ÷ 6 = 16 slots, or 1 and 17. Therefore the 1 and 11 pitch would give a chord factor of sin (10 ÷ 16) (180 ÷ 2) = 0.839. Accordingly after reconnecting for six poles series-delta the machine would be good for a line voltage of (1,200 ÷ 900) × 440 × (0.839 ÷ 0.966) = 508 volts.

SQUIRREL-CAGE MOTOR BEFORE AND AFTER CHANGING SPEED

	Before	After
Horsepower	75	75
Volts	440	440
Revolutions per minute	90	1200
Poles	8	6
Coils	96	96
Pitch	1–11	1–11
Chord factor	0.966	0.839
Connection	Series-delta	Series-delta
Groups	24	18
Coils in series, per group	4	*6 and 5

*Coils in series per group as follows: 655, 556, 565, 655, 556, 565.

With this voltage on the winding the magnetic conditions would be the same as before the change, and as the speed has been increased the horsepower would likewise increase to (1,200 ÷ 900) × 75 = 100 hp. But as only 75 hp. was required the torque will have to be decreased by decreasing the applied voltage to a lower value than 508 volts. The torque for a 100-hp., 1,200-r.p.m. motor is (100 ÷ 1,200) × 5,252 = 438 lb.-ft. This will have to be reduced to the torque for a 75-hp., 1,200-r.p.m. motor, which is (75 × 5,252) ÷ 1,200 = 328.5 lb.-ft. The voltage may be calculated from the formula: $E_1 = E\sqrt{\frac{T_1}{T}}$, where T = torque at full voltage, T_1 = torque at reduced voltage, E = full-line voltage, E_1 = reduced line votage. Therefore

$$E_1 = 508\sqrt{\frac{328.5}{438}} = 439 \text{ volts.}$$

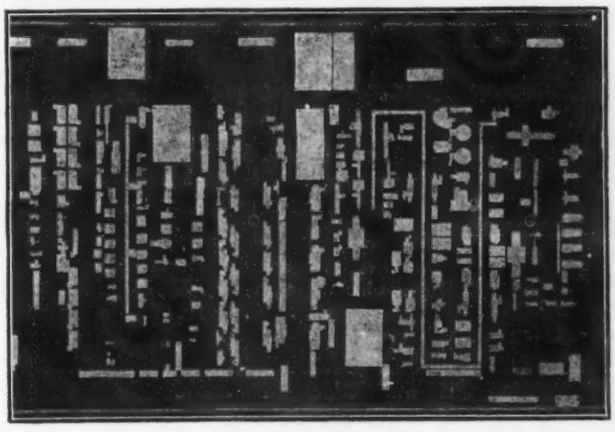
Therefore the motor may be connected to a 440-volt line. Accordingly the winding was regrouped and connected series-delta, top-to-top in eighteen groups, six groups of six coils in series and twelve groups of five coils in series, arranged as follows: 655, 556, 565, 655, 556, 565. It was not necessary in this case to reinsulate the coil ends of adjacent phases after regrouping as the ends of all coils were already covered with two layers of half-lapped cotton tape and the entire winding had been impregnated. After putting the motor back in operation it was found necessary to change the auto-transformer to a 65 per cent tap for starting. The starting torque had decreased because there were more bars of the rotor in parallel per pole, resulting in lower resistance. It was noticed that on account of the same fact when the motor was running the slip had decreased and the efficiency was slightly higher than before the change and that the motor started and carried its load satisfactorily to all concerned.

A. C. ROE.

Detroit, Mich.

Proposed Changes in Factory Distribution Visualized by Cardboard Models

FOR calculating the advantages and problems of changing the location of motor-driven factory machines a Canadian company has a permanent plat of the factory laid out on a board in the office and on this plat the location of each machine is indicated by a



FACTORY PLAT ON WHICH PROPOSED CHANGES IN LOCATION OF MACHINES AND MOTORS ARE WORKED OUT

piece of cardboard which shows the relative size and shape of the machine. There are two shops in this plant, and one of the shops is represented on each side of the board.

Individual drive is used throughout this plant, and there is a power distributing board on every column. As the bays are 30 ft. x 40 ft. (9 m. x 12 m.) no machine is more than about 15 ft. (4.5 m.) away from its source of energy, so that, irrespective of the changes made in the location of the machine, the cost of changing the wiring is very small. Taking the plant as a whole, the size of the motors ranges from ½ hp. to 50 hp. The feeders are designed to meet such combinations as it is possible to get with motors up to 50 hp., and any rearrangement of the manufacturing layout only necessitates changes in the short individual motor circuits from the distributing panels.

A. H. MAY,
Works Engineer.

Canadian Products, Ltd.,
Walkerville, Ont.

Smoothing of Commutators by Sanding and Stoning

SOME hints to follow in sandpapering commutators and grinding them with a stone are embodied in the following paragraphs. If sandpaper is used, it is best to select a rather fine grain. This may take longer, but deep scratches will be avoided and subsequent operation improved. A very fine grain should be selected for the final polish. Best results will be attained by attaching the paper to a block of wood cut to the radius of the commutator. One objection to the use of sandpaper is that it rarely leaves the bars properly round. On an unslotted commutator, particularly where the mica is high, the sandpaper has a tendency to flatten the center of the bars. This can be partly counteracted by the use of a small amount of oil, which tends to make the mica cut more readily and reduces the cutting effect on the copper. Oil should not be used in excess or it will work into the mica, carrying particles of copper with it, and short circuits will result. Oil should never be used when sanding a slotted commutator. On a slotted commutator sandpaper, even when used on a block rounded to fit the commutator, has a tendency to flatten or bevel the edges of the bars.

A hand stone has advantages over sandpaper, provided that a stone with smooth, fine grain and free cutting properties is selected. Its rigidity eliminates any tendency to flatten the commutator segments and also prevents pitting and gouging. However, eccentricity or broad, flat spots can be removed only by grinding or turning. The limitation on the use of a hand stone is a question of whether or not it can be kept from jumping as the inequalities of the surface pass under it. Where a substantial rest is provided for the stone it may be used as a hand-turning tool to remove flat spots which could not be permanently removed by simply holding the stone against the commutator. This method requires a much smaller area of the stone in contact with the commutator than in the previous method. If too large an area is in contact, the stone will slide over the surface instead of cutting steadily. Hand-turning with a stone requires considerably more skill on the part of the operator than holding the stone flat against the surface. The support on which the stone is rested may be mounted securely on the brush arm, and must be very rigid or the stone will vibrate and therefore irregularities and holes in the surface of the commutator will result.

When sandpapering or holding the stone flat on the commutator it is best to run the armature at its normal operating speed. In hand-turning with a stone it may be better to reduce the speed somewhat. This can be determined by experimenting to find the speed at which the stone cuts most freely. If the speed is too slow, pieces of the stone are likely to chip into the commutator, and an excessive speed tends to produce uneven results.

After finishing the commutator it should be wiped off carefully to make sure that all particles of free copper have been removed, and the armature should be blown out thoroughly. It is also well to make an electrical test for grounds before putting the armature back into service.

DONALD S. MERTON.

Cleveland, Ohio.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

Seventeen Utility Employees Receive Medals for Heroism

IN RECOGNITION of heroic service at its Water Street power plant seventeen employees of the Toledo (Ohio) Railways & Light Company were recently presented with medals by the National Doherty Fraternity. In the accompanying illustration J. W. Brown, head switchboard operator, is shown receiving a gold medal from F. R. Coates, president of the company. Last February when one of the generators blew up, scattering pieces of iron castings in every direction in the plant, Mr. Brown risked his life as he stuck to his post just

PRESENTATION OF MEDALS TO EMPLOYEES OF THE TOLEDO RAILWAYS & LIGHT COMPANY

above and opened a switch. This action prevented the wrecking of the entire plant, which would have plunged the city in total darkness and stopped all street cars.

Fellow employees on duty at the same time received duplicates of the medal in bronze. This is probably the largest group of public utility employees ever so recognized. All are members of the local Doherty fraternity. Those in the picture besides Mr. Coates and Mr. Brown are Stephan Hayes, James Bozman, George Kading, S. Nevitt, H. H. Herbert, J. D. Stevens, Frank Brown, J. J. Kelley, Charles Delker, R. A. Washburn, F. Hamman, Charles Baldwin, T. J. Nolan, Fred Landwehr, R. D. Metzler and George Dolling.

Data on Electrically Driven City Pumping Plant

WATER to supply Coleraine, Minn., which requires some 400,000 gal. (1,514,000 l.) per day, is obtained from two deep wells at an energy consumption of less than 1.5 kw.-hr. per 1,000 gal.

Well No. 1 is equipped with a vertical-type centrifugal deep-well pump designed for 80 ft. (24 m.) head and an output of 400 g.p.m. (25 l. per second). The pump has a 6-in. (15-cm.) discharge and is directly connected to a 25-hp., 1,200-r.p.m., three-phase, 60-cycle, 440-volt vertical motor. There is a similar pump on No. 2 well except that this unit is designed to pump 600 g.p.m. (38 l. per second) against a head of 110 ft. (33 m.), has an 8-in. (20-cm.) discharge and is directly connected to a 35-hp. vertical motor. These pumps bring the water to a reservoir. The power requirements as shown by tests are given in the following tabulation:

ENERGY REQUIRED FOR PUMPING FROM WELLS TO RESERVOIR

	Gal. per Minute	Kw.-hr. per 1,000 Gal.
Well No. 1	471	0.295
Well No. 2	554	0.6613
Average	512.5	0.4781

The water is taken from the reservoir to an overhead tank by two 5-in. two-stage 500-g.p.m. centrifugal pumps driven by 50-hp., 1,800-r.p.m. motors working against a head of 235 ft. The tests on these pumps show the following results:

ENERGY USED IN RAISING WATER TO TANKS

	Gal. per Minute	Kw.-hr. per 1,000 Gal.
West pump	498	0.8318
East pump	521	0.8214
Average	509.5	0.8266
Both pumps in parallel	824	1.0012

The average pumpage during the winter days is about 386,000 gal. (1,460,000 l.), but on Sunday the average drops to 245,000 gal. (925,000 l.). The average energy consumption from wells to tank is 1.3047 kw.-hr. per 1,000 gal. (340 watt-hours per 1,000 l.) with one set of pumps. When both sets of pumps are operating together the energy consumption goes up to 1.4793 kw.-hr. per 1,000 gal. (370 watts per 1,000 l.).

Low Power Factor Penalized by Increased Service Charge

WITH the idea of discouraging overmotoring in industrial plants and the consequent low power-factor conditions the Cumberland County Power & Light Company, Portland, Me., has added a power-factor clause to its power rate. Customers whose installed capacity exceeds 100 hp. are required to maintain a power factor of 80 per cent between 7 a.m. and 6 p.m. on weekdays. In effect, customers whose power factor is below 80 per cent will be penalized by an increase in the service charge. The clause as filed with the Maine Public Utilities Commission reads:

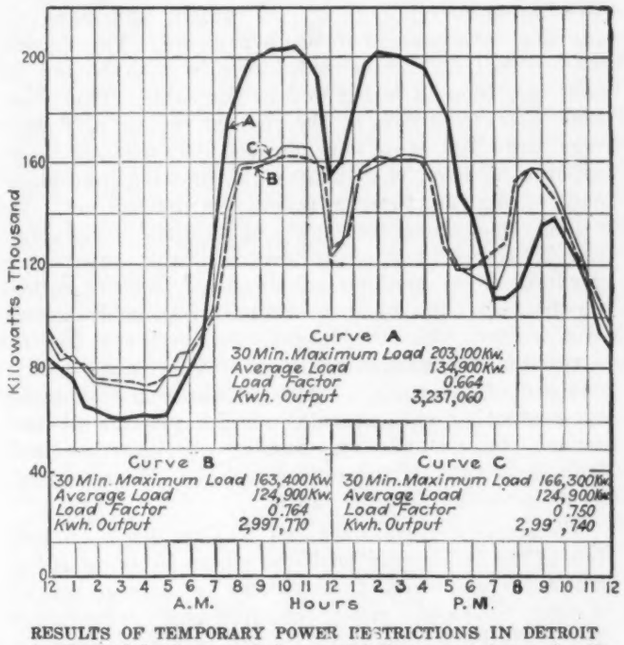
Wherever the installed capacity in electrical equipment exceeds 100 hp. the customer agrees to maintain at all times between 7 a.m. and 6 p.m. on week days a power factor of 80 per cent or higher. Should the company at any time find the power factor to be lower than 80 per cent and so notify the customer, then the customer shall make the necessary changes or additions to its equipment to bring the power factor up to or above 80 per cent. Should

the customer fail to correct the power factor as above within three months of the date of the above-mentioned notice by the company, the service charge of this rate shall be increased by the following percentages until such correction has been made:

Power Factor of Customer's Load per Cent	Per Cent Increase in Service Charge
75 to 79	7½
71 to 75	15
61 to 70	30
51 to 60	60
50 and below	100

Customer Co-operation Reduces Peak During Power Shortage

WHEN accidents to generating equipment made it necessary for the Detroit Edison Company to ask its primary power customers to reduce by 50 per cent their demands for energy between the hours of 7 a.m. and 5 p.m. the customers loyally responded, as the accompanying load curves of the company show. By reducing their use of power requirements wherever possible, by using internal combustion engines and by transferring men to a night shift the industrial customers reduced the maximum demand from over 200,000 kw. to about 165,000 kw. They made the evening peak between 8 and 9 p.m. about equal to the day peak, increased the minimum load between 2 and 4 a.m. by from 12,000 kw. to 16,000 kw. and increased the daily load factor by about 10 per cent. Only during dark days and storm periods would the day load reach temporary demands of about 175,000 kw.



RESULTS OF TEMPORARY POWER RESTRICTIONS IN DETROIT

A—Typical load curve before restrictions were imposed. B—Typical load curve with restricted service, showing about 25 per cent decrease in day demand and considerable increase in night load. C—Curve showing ironing load between 9 a.m. and 11:30 a.m. on Tuesdays.

The electric ironing load of from 4,000 kw. to 6,000 kw. was noticeable on Tuesday, unless there had been inclement weather on the day previous. In that case the ironing load came on Wednesday. When this load happened to come on a dark day, as it did on at least two occasions, it came near to being the "last straw."

When general business began to slow down in the latter part of August the curves showed a reduction of night work, and it was apparent that many plants reduced their night force first as their business fell off, until the point was reached where small departments formerly operating at night were put on the day load. Also, some of the gasoline engines used temporarily in plants to help carry the day load were giving out and had to be replaced by electric motors.

As a result the day peak was kept up to an average of 165,000 kw. until the beginning of October. However, beginning with the week of Oct. 4 the day peak began to drop so that when all power restrictions were removed on Nov. 4 there was no large increase in the maximum demand nor was there any marked change in the shape of the company's load curves.

Proposed Policy of Northwest Electrical Service League

RECOMMENDATIONS evolved by the advisory committee of the Northwest Electrical Service League when it was in process of formation have been called to the attention of the executive body of the league for consideration as a general policy, as follows:

1. That all member companies of the Northwest Electric Light and Power Association retailing electrical devices do so at a profit.

2. That all central-station companies engaged in inside wiring business discontinue same wherever the field is properly served by a local contractor-dealer.

3. That all member companies not already holding associate memberships in the state associations of electrical contractors and dealers be requested to apply for memberships in such associations.

4. That a co-operative advertising plan might be formulated by the advisory committee.

5. That for the general good of the industries a plan be formulated to strengthen the weak links in the chain of electrical interests serving the public.

6. That a reciprocal plan of education be carried out between all the elements in the business.

7. Suitable machinery should be set in motion to safeguard all branches of the industry from legislative and political injustice and at the same time properly support corrective legislation and regulatory action.

8. That the very best thought of the men engaged in all branches of electrical industry in this district be applied to the creation and development of a fixed policy that will have as its objective the establishment of the highest standard of business practice possible, so as to make our business from the standpoint of stability and usefulness comparable with any known line of activity in the community.

9. That the electrical interests be encouraged to use the greatest practical care in the selection of men who are employed or induced to engage in the business, with the view that in the process of development they are most likely to prove a wholesome addition to the personnel of those already engaged in the business.

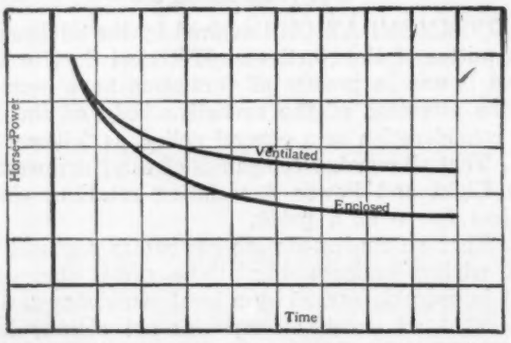
10. We suggest that member companies Northwest Electric Light and Power Association encourage contractor-dealers to affiliate with the state Contractor-Dealers' Association, in the belief that closer co-operation and better results can be secured by associated methods than can be obtained as individuals, owing to the facilities provided for co-operation between the Contractor-Dealers' Association and central stations as now organized.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Direct-Current Motors for Crane and Hoist Work.—F. L. MOON.—After giving details of the importance of selecting the motors carefully for crane work on account of exposure to dirt, moisture and heavy electrical service, the writer makes a comparison between inclosed and ventilated motors with regard to heating and efficiency. The illustration indicates the time during which



TIME VARIOUS LOADS CAN BE CARRIED FOR A CERTAIN TEMPERATURE RISE

the various loads can be carried for a certain temperature rise. The ventilation does not influence the capacity for short time ratings, but increases the capacity for long periods. It is said that the core loss and friction losses would be about the same for the two types of motors, but the I^2R loss would be somewhat greater for a ventilated motor. The loss due to the energy stored in the rotating parts, however, during acceleration would be much less in the case of the ventilated motor.—*Electrical Journal*, November, 1920.

Lamps and Lighting

Illumination and Production.—R. E. HARRINGTON.—The importance of electric lighting is pointed out from the standpoint of health, labor turnover, safety, spoilage and production. In order to show what a relatively insignificant item the investment in good lighting equipment is, the cost per outlet is compared with the wages of one workman. This is shown in the following table:

Cost of lamp (list, subject to discount)	$1.10
Cost of enameled steel reflector (list subject to discount)	2.50
Estimated cost of wiring per outlet	6.00
Total first cost	$9.60
Interest on investment at 6 per cent	$0.58
Depreciation on reflector and wiring at 12½ per cent	1.06
Power at 5 cents per kilowatt-hour	3.00
Cleaning at 3 cents per cleaning, two per month	0.72
Renewal of lamp (600 ÷ 1,000) × $1.10	0.66
Total	$6.02

Wages for eight hours per day, 300 days, at 70 cents per hour are $1,680.
Ratio of cost of lighting per man to wages, $6.02 ÷ 1,680 = 0.356 of 1 per cent.

It is said that if the workman saves three minutes' time per day owing to correct lighting the entire operating cost of the lighting system is paid for.—*Bulletin L. D. 106, Edison Lamp Works*, May, 1920.

Monograph on Illumination.—GEORGE A. HOADLEY.—A historic treatment of the subject, starting from the bonfire and tracing developments to the modern electric lighting systems of today.—*Transactions Illuminating Engineering Society*, Oct. 9, 1920.

Generation, Transmission and Distribution

Lead-Covered Single-Phase Cables.—CAPEDEVILLE.—This paper forms an elaboration of the note by the same author to the French Academy which was referred to in the Digest some time ago. After showing how magnetic induction will cause very strong currents to flow along the lead covering of single phase alternating-current cables, the author discusses the practical consequences of the phenomenon. The simplest way to deal with the sheath currents is to ground the lead sheathing at either end of the cable. This, however, gives free flow to the current, which may grow very large and cause considerable loss, followed by an apparent increase in resistance. If the cable is grounded only at one end, then, owing to the induced emf., the voltage rises along the cable and an undesirable potential difference may occur between cable sheath and ground. Other methods are discussed, such as cutting up the cable sheathing in mutually insulated sections, each one grounded or each connected to the next through a resistor, the ground connection being made only at one end of the cable. Better equalization is obtained by connecting the midpoint of the resistor at each section to ground, or, finally, by inserting self-inductance coils at the section points.—*Revue Générale de l'Electricité*, Sept. 11, 1920.

Electrical Refrigeration.—C. J. CARLSEN.—An analysis of the ice-making business, where electrical refrigeration is employed, as conducted by a large central-station company, gives the following information: There were forty-one large ice and refrigeration plants on central-station service, with a total connected load of 18,215 hp., a combined service maximum of 12,907 kw. and a consumption of 55,713,226 kw.-hr. Of the latter amount 49,754,000 kw.-hr. was used in the production of 1,056,093 tons of ice, or an average for all plants of 48 kw.-hr. per ton, although the best plant produced at the yearly rate of 37 kw.-hr. per ton. The annual load factor of all plants was 45 per cent.—*Electric Journal*, November, 1920.

Traction

Locomotives for Swiss Electrifications.—SCHRAEDER.—This article contains a detailed description of a type of electric locomotive for mixed service built by Brown, Boveri & Company for certain electrified railway stretches in Bernina. The new electrifications connect the Lötschberg railroad, having a 16⅔-cycle, single-phase, 15,000-volt supply. The locomotive has two twelve-pole motors, of a compensated series type, with resistance connections between commutator and arma-

ture coils and with shunted interpoles. The motors have a one-hour rating of 645 hp. and weigh only 5,300 kg. (11,700 lb.). This is considered an unusually low value, corresponding to only 8 kg. (17.6 lb.) per 1 hp.-hr. The two contact arms on the locomotive are connected to a transformer which steps down the supply current from 15,000 volts. The transformer has a number of taps on the secondary side so that the motor voltage can be varied from 100 to 620 volts, whereby a wide speed range is obtained. The transformer is oil-cooled. In order to cut down the weight it is provided with an oil circulation pump and an effective radiator, served by a fan. The locomotives pull 8,000 kg. (17,659 lb.) continuously for one hour at a speed of 35 km. per hour (22 miles per hour). The maximum speed is 60 km. per hour (37 miles per hour).—*Mitteilungen*, July, 1920.

Installations, Systems and Appliances

Lightning Arresters.— C. E. BENNETT.— A brief statement of the characteristics of the Bennett surge arrester which was described in the ELECTRICAL WORLD of Feb. 14, 1920. Some interesting characteristics of the water tanks in absorbing energy of surges are described in this article.—Paper read before convention of A. I. and S. E. E., October, 1920.

The Induction Electrical Furnace.—G. H. CLAMER.—This is a very complete treatise on the development of induction furnaces. Early historical development is first traced, and then the author deals with the more modern type by giving the purpose and advantages of each. Furnaces for brass—that is, all copper and zinc alloys commonly referred to as "brass"—are dealt with by the author.—*Journal of Franklin Institute*, October, 1920.

Electric Lifts and Cranes.—F. R. HOUSDEN.—In this article motors and control for lifts and cranes and also some characteristics of lifting magnets are discussed.—*Beama*, October, 1920.

Electrophysics and Magnetism

The Audion Oscillator.—R. A. HEISING.—Conditions required for the production of free oscillations in audion oscillator circuits can be mathematically predetermined. This necessitates an assumption of a straight-line characteristic for the tube, which assumption becomes exact for small oscillations. The required conditions can be expressed in terms of the constants of the circuit elements and the constants of the tube. The equations are set up as for ordinary circuits, making use of Nichols' explanation of the behavior of the audion, in which the amplifying action is ascribed to a fictitious generator placed between the plate and filament inside the tube and having a voltage μ times the voltage applied to the grid. Two simple circuits are treated in detail and results plotted in several sets of curves.—*Physical Review*, September, 1920.

Electrification by Impact.—HAROLD F. RICHARDS.—The author suggests that impact of dielectric upon metal, without sliding friction, may cause an electrical effect whose laws will shed light upon the frictional phenomenon. These charges are of the same order of magnitude as those obtained by friction. From his experiment he concludes that there is no direct dependence of the electrical energy upon the mechanical energy lost in impact, and that electrification by impact is similar in nature to the contact effect between metals.—*Physical Review*, October, 1920.

Units, Measurements and Instruments

On the Wave Form of Intermittent and Pulsating High-Tension Currents.—The author has studied the wave form of the secondary current in an induction coil for X-ray work. Certain definite relations were established between primary capacity and the number of pulses in the secondary current wave. A number of very fine oscillograms show that beautiful results may be obtained by the Gehrke vacuum-tube oscillograph, which was used throughout the work.—*Archiv für Elektrotechnik*, Oct. 10, 1920.

Photographing the Stream Lines in Flowing Water.—CAMICHEL.—The motion of flowing water may be explored by a method which is based on photographic registration of the orbits of little bubbles of air carried away in the water. A strong beam of intermittent light is projected into the water. The air bubbles then light up, owing to their strong reflection, and on the photographic plate of a camera the trace of the bubbles will appear as an intermittent curved line, its direction following a stream line in the water, and the length of each dash indicating the velocity of the water particles in each part of the path. Some beautiful plates characteristic of different types of motion and also showing analogies with electric and magnetic field tracings are reproduced and explained by applying fundamental hydraulic equations, the methods of images, etc.—*Revue Générale de l'Electricité*, Sept. 11, 1920.

Telegraphy, Telephony and Signals

The Alexanderson System for Radio Communication.—ELMER E. BUCHER.—It is said that the attainment of a system of radio communication free from the limitations of the arc and spark-gap types has been realized in the Alexanderson system, that it has introduced into the realm of radio the same degree of certainty of expectations and reliability of results in generation, control and distribution as has for a long time been characteristic of operations in the field of light and power. The generator, although necessarily of special construction, is designed in conformity with established electric magnetic and mechanical laws. Its speed is held constant within one-tenth of 1 per cent by an especially developed speed regulator. The output of the station, which fluctuates with the messages being sent, is controlled by an ingenious and extremely sensitive, non-arcing magnetic amplifier. The multiple tuning of the antenna permits of radiating the energy at a greatly improved efficiency. The author thoroughly describes the complete system in great detail.—*General Electric Review*, October, 1920.

Theoretical Principles of the Traffic Capacity of Automatic Switches.—G. F. O'DELL.—Theories for the determination of the number of switches required in automatic exchanges to carry different quantities of traffic are discussed by the author with particular reference to the requirements of actual practice.—*Post Office Electrical Engineers' Journal*, October, 1920.

Miscellaneous

Electrical Goods in Spain.—PHILIP S. SMITH.—It is pointed out that Spain is a country with great water-power resources but that the electrical development has been relatively limited. The report contains a very complete analysis of the electrical apparatus required as power developments increase.—*Bulletin No. 197, U. S Bureau of Foreign and Domestic Commerce*, 1920.

GOVERNMENT regulation of the coal industry is recommended in the report made to the United States Senate by its committee on production and reconstruction, of which Senator Calder of New York is chairman. The report severely arraigns the practices that have grown up among private interests now in control of mining and distribution.

MORE than $200,000 worth of advertising space has thus far been devoted by electrical manufacturers to the co-operative good-will campaign of the industry.

SPEAKING before the Chicago Rotary Club, Samuel Insull declared that if politicians are to attack utilities as a stepping stone to office it will become impossible for the utilities to raise the capital requisite to expand their plants in order to supply the increasing demands of the public.

THE MEXICAN State of Sonora is reported to be making progress toward the construction of its 100,000-hp. hydro-electric and irrigation project on the Sonora River, 75 miles from Hermosillo. The storage reservoir is designed to irrigate 750,000 acres of land. Several great modern dams will be built.

AN ALTERNATIVE amendment to the water-power act has been introduced in the House of Representatives as a substitute for the one fathered by Secretary Payne. The new amendment repeals only that provision of the act which permits issuance of water-power licenses in national parks. The provisions of the other amendment are much more sweeping.

A FURTHER amendment to the water-power act permitting lands found to have no power value to be restored to entry without reservation is understood to be favored by the Federal Power Commission.

MASSACHUSETTS electric light and power companies will probably ask the State Legislature for authority to issue stock to the amount of premiums earned by their securities.

APPROVAL of the plan to equip four of the boilers of the Lake Union steam plant of the Seattle municipal electric works with stokers in order to guard against shortage of oil fuel has been given by the city's Board of Public Works.

A FIFTH plant on the Spokane River is to be begun at once by the Washington Power Company. It is to develop 14,000 hp., which will raise the total capacity of the company to 125,000 hp.

SEASONABLE electrical material has continued in good demand, though hardly up to early expectations. Household heating appliances are selling well, and there is a fair demand for appliances driven by motors. Little change in demand for wiring materials is reported. Jobbers and dealers are both buying cautiously. Transportation is now good, and stocks are improving. Pipe is said to be shortest of all items. The credit situation is no worse. Lamp sales are excellent.

News in Brief

Summary of Market Conditions and of Recent and Approaching Happenings of Importance to the Industry

CALIFORNIA is incorporating in the electrical safety orders of the Industrial Accident Commission rules which four years of field experience have shown to be necessary.

LEGISLATION requiring the registration of engineers and architects is to be sought in Ohio this year. The bill has been drafted by the Ohio Association of Technical Societies.

SAFETY is to be the keynote of the Detroit meeting of the Western Association of Electrical Inspectors next month, to which central-station men, manufacturers and other nonmembers are invited to contribute.

PLEADING for support of the Federated American Engineering Societies before the Chicago Engineers' Club, Herbert Hoover gave expression to the view that the regulation of public utilities is essentially a problem for engineers.

STANDARDIZATION of lamp voltages is being strongly backed by the lamp committee of the National Electric Lamp Association.

A COMMISSION of expert engineers to consider the best methods of carrying out the Chicago terminal electrification has been appointed by the Illinois Central Railroad.

THREE new members and nine new associate members have been elected by the Edison Pioneers.

AN ADVANCE from 7 per cent to 7½ per cent less depreciation in permitted earnings for the purpose of rate fixing has been announced by the Missouri Public Service Commission as a change in its policy.

ASSERTED failure of an Illinois electric light and power company to make improvements ordered by the Public Utilities Commission has led to a reduction being ordered in a surcharge previously allowed the company.

ANNOUNCEMENT is made that the Western Canada Power Company has passed into the control of the British Columbia Electric Railway Company as the outcome of a transaction involving between $7,000,000 and $8,000,000.

JOINT meetings on water power in its various aspects are being held in Boston by the electrical, mechanical and civil engineering societies. The first of three arranged for took place last night.

A SHORT intensive course for metermen is announced by the extension division of the University of Wisconsin.

A DISCUSSION on the relative merits of 40-deg. and 50-deg. motors formed the program of the Cleveland meeting of the Association of Iron and Steel Electrical Engineers. The A. I. E. E. is to take up the subject.

CENTRALIZED control of power districts was the subject of animated discussion at the meeting of the American Society of Mechanical Engineers in New York.

CONTRACTS for electrical equipment approximating $2,000,000 have been awarded to Canadian electrical manufacturing firms by the Ontario Hydro-Electric Power Commission.

A SUBSTANTIAL output of transformers is reported to be coming from the manufacturing plants. Demand is not so great as last summer and spring. Typical deliveries of distribution transformers range from stock to eighteen weeks.

MANUFACTURERS of both friction and compound tape anticipate a good year in 1921. Reduction in prices is not expected to exceed 10 per cent in view of the continuing high cost of labor, fuel, transportation and materials.

WITH the object of broadening the export field, the Foreign Trade Financing Corporation is to be launched as the result of a conference of representatives of agriculture, finance and business from all parts of the United States.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

A. I. E. E. to Sponsor 40-Deg.-50-Deg. Motor Investigation

SPONSORSHIP for the investigation of the general subject of temperature rise in rotating electric machines, which include the 40-deg.-50-deg. motor situation, has been assigned by the American Engineering Standards Committee to the American Institute of Electrical Engineers. The investigation will be made through a sectional committee of the American Engineering Standards Committee which will be chosen by a steering committee appointed by the A. I. E. E., and composed of Prof. D. C. Jackson, who is chairman of the Institute's standards committee, as chairman; L. T. Robinson of Schenectady, N. Y., and James Burke of Erie, Pa. On the sectional committee all interested bodies will be represented.

It is proposed to investigate two main subjects in a thorough and unbiased fashion. These are:

1. Standardization of motors as regards temperature rise, whether 40 deg., 50 deg. or some other limit.

2. Standardization of large generating and motor equipment using the class B (mica and similar insulation) designation for temperature rise.

More Than $200,000 Already Placed for Co-operative Good-Will Advertising

ALREADY more than $200,000 worth of advertising space has been set aside by electrical manufacturers for the co-operative good-will campaign in the electric light and power industry. In making this announcement at the meeting in Chicago last week of the executive committee of the Public Relations Section, N. E. L. A., P. L. Thomson of the manufacturers' advertising committee said that several large electrical manufacturers had placed their space in national mediums at the disposal of the committee and that forty smaller manufacturers had agreed to assist in every way possible through trade-journal advertising and otherwise.

The direct "tie-in" advertising in the national periodicals by the N. E. L. A. was approved.

Utility Regulation an Engineers' Problem, Says Hoover

PUBLIC utility regulation was discussed by Herbert Hoover on Dec. 10 in the course of a plea for support of the Federated American Engineering Societies made at a meeting under the auspices of the general committee of the technical societies of Chicago. Such regulation, Mr. Hoover said, has heretofore been in the direction of negative control, and in the future a way must be found to protect the public from monopoly and at the same time restore the initiative necessary for successful utility operation. Engineering thought must be brought to bear on the problem.

Mr. Hoover asserted that the form of organization and constitution were of secondary importance, but that some organization representing all engineering thought and not that of special groups must be perfected if the ability of the engineer to look at pressing national problems from a detached point of view, free from selfishness and special interest, is to be utilized. He pleaded that personal opinion should be laid aside and effective organization to utilize this ability for the public welfare be perfected.

Other Amendments to Water-Power Act Thought Desirable

THE first finding under Section 24 of the water-power act was made by the Federal Power Commission at its meeting Dec. 13, when it restored to entry certain lands along the Coquille and Rogue Rivers in Oregon, with the reservation that power developments are to be unimpeded.

The commission very evidently believes it desirable to procure an amendment to the act so that lands found to have no power value can be restored to entry without reservation. In addition, it is believed that the amendment should provide that lands which ought not to be restored may be used temporarily under lease or permit. Another amendment which appears desirable would give the commission jurisdiction over all water-power projects. As the law stands, the Departments of War, the Interior and Agriculture retain jurisdiction over projects authorized under the laws prior to the enactment of the water-power act.

Centralized Control of Power Districts Discussed by A. S. M. E.

A POLICY for future power development and some of its financial and legal aspects proved to be subjects of considerable interest at the Power Section session of the American Society of Mechanical Engineers on Dec. 10. Another closely related and interesting subject of discussion was the effect of load factor and size of plant on the unit cost of electrical energy. Addresses on the three topics named were made by Col. J. P. Jackson, Col. Peter Junkersfeld and George Orrok, respectively. Among those who took part in the discussions were John W. Lieb, I. E. Moultrop, John H. Stevens, W. B. Jackson, Harold Doolittle, E. B. Powell, Charles Penrose, Prof. Charles W. Thomas, Walter N. Polakov, Commander E. H. DeLany, W. S. Murray, Henry Harrison Suplee and James T. Enes.

Colonel Jackson gave warning that the United States is entering the keenest trade competition it has ever experienced and that therefore, more than ever, it is essential to utilize power resources in their maximum extent and efficiency to help reduce manufacturing costs. Because of technical financial or market conditions it

may not be economical to develop all potential water powers, but nevertheless six billion dollars will have to be invested in electric service equipment in the next ten years to keep up with the demand for service. It will be necessary to develop systems that will insure the greatest conservation of natural resources and the most convenient utilization of energy, and then to supply isolated plants and railroads, which if they generate their own power use two to four times the coal per unit of energy produced that central stations do.

The present tendency, Colonel Jackson said, is toward establishing natural power districts in which the power plants will be interconnected for the most economical system of generation and distribution. Before these interconnections can be an absolute success, however, the districts must have a central organization, preferably composed of or supported by the operating companies, to direct the financial and operating problems. The West Penn Power Company and the American Gas & Electric Company have established such an organization for control of activities where they are jointly involved, and several years' trial has proved it a success. Another successful example of centralized control is that recently exercised by the California Power Administrator,in the recent water emergency.

Another subject which needs special attention, Colonel Jackson pointed out, is the development of laws whereby capital will be assured of a stable return. Closely allied with this is the need of offering some inducement for increased economy. London provides such a reward for efficiency by law. The importance of distributing stock among the local public was also emphasized and the methods of making it available described. A properly designed unified plan such as outlined, concluded Colonel Jackson, should command the support of the public and protect the investment.

Commission for Illinois Central Terminal Electrification Appointed

A COMMISSION of engineers to consider the best methods of carrying out the electrification of the Chicago terminals of the Illinois Central Railroad has been appointed by the railroad company. The members of this commission will be A. S. Baldwin, vice-president Illinois Central Railroad, chairman; Daniel J. Brumley, chief engineer of the Chicago terminal improvement; Bion J. Arnold, consulting engineer; George Gibbs, of Gibbs & Hill, consulting engineers in New York; Dr. Cary T. Hutchinson, consulting engineer, New York, and W. M. Vandersluis, expert on electrical signal systems and for many years signal engineer of the Illinois Central, who will serve as secretary of the commission.

"It probably will be about six months before the report of the commission can be made," Mr. Brumley said in commenting upon these appointments. "The commission will consider the advisability of installing a low-voltage direct-current system, a high-voltage direct-current system and a high-voltage alternating-current project. It will consider operation and maintenance of the various systems and will recommend the adoption of the one best suited to the railroad's requirements.

"It is likely that after the commission has completed its preliminary work it will be retained as a permanent body to design, direct and superintend the installation of the system adopted. Under the ordinance the first electrification work should begin not later than early in 1922."

Poor Service Means End of Higher Rates

UNLESS Illinois public utility companies keep their service up to the top notch increased rates will be denied them. This was indicated in an order issued by the Public Utilities Commission of Illinois last week in which it cut the surcharge of 15 per cent on commercial lighting previously granted the McHenry County Light & Power Company to 10 per cent.

The commission some time ago authorized the company to increase its rates to meet the mounting costs. At the same time the commission directed that the company make certain improvements in its system at Hebron and Richmond. This, it is asserted, the company neglected to do, with the consequence that the rates were cut as just stated.

Value of Customer Ownership Pointed Out by Martin Insull

PUBLIC utility securities as logical investments for utility customers were dealt with by Martin J. Insull, president of the National Electric Light Association, before the annual meeting of the Illinois State Electric Association at Chicago last week. As part of the general public, Mr. Insull asserted, these investors are in a position to influence commissions to allow the companies to earn a fair return on the capital invested. The small investor cannot as effectively protect his investment in any other great enterprise, the speaker continued, and it is difficult to find a business that is growing more rapidly. The present annual capital requirements of Illinois utilities, Mr. Insull stated, about equal the total 1905 investment.

The remarks of Mr. Insull on this topic were made in the course of a discussion on the work of the Illinois Committee on Public Utility Information. John F. Gilchrist outlined what the committee had done. B. J. Mullaney attributed the success of its activities to its independent, straightforward statements and to the fact that it is working for the entire utility business and for the public.

Adam Gschwindt, Rockford, was elected president for the ensuing year; D. E. Parsons, East St. Louis, was made vice-president, and R. V. Frather, Springfield, secretary-treasurer. The members elected to the executive committee were R. S. Wallace of Peoria, B. J. Denman of Davenport, Iowa, and H. O. Channon of Quincy. A report in last week's issue covered the addresses of other speakers.

Advanced Work of Federal Power Commission May Be Delayed

WHETHER or not the provisions of the water-power act can be carried through to conclusion promptly depends to a great extent on the necessary funds. The work has gone about as far as it can with the more advanced projects until Congress authorizes the Federal Power Commission to employ the necessary personnel and provides the money required for salaries. O. C. Merrill, the executive secretary, has prepared an estimate, which has been approved by the Secretary of the Interior, calling for $482,065.

Before the end of December the advertising stage will have passed on several of the projects, but further action will be delayed because no license or permit forms have been drawn up and because certain of the essential regulations are yet to be prepared.

Another National Park Water-Power Law Amendment Introduced

NO COMMITTEE action had been taken at the time of this writing in either house of Congress in the matter of the amendment to the water-power act intended to protect the national parks. The amendment submitted by Secretary of the Interior Payne and introduced by Senator Jones and Representative Esch goes further than the precluding of power development and would amend all other right-of-way acts. As drafted by Secretary Payne, no permit, license, lease or authorization for dams, conduits, reservoirs, power houses, transmission lines or works for storage or carriage of water will be granted within the limits of any national park.

On the other hand, Representative Rogers of Massachusetts has introduced an amendment intended only to repeal the provision of the water-power act which authorizes the issuance of water-power licenses in national parks. It is not improbable that the Rogers resolution may be adopted.

Users and Producers Discuss 40-Deg. Vs. 50-Deg. Motors for Steel Mill

THAT a motor driving steel-mill machinery should have a generous margin of power above the normal or the estimated load was the thought generally expressed by the mill engineers at a meeting of the Association of Iron and Steel Electrical Engineers in Cleveland on Dec. 13. It seemed to be the opinion that this overload ability was met satisfactorily in the 40-deg. motor, although 50-deg. motors are operating with perfect satisfaction on certain loads where careful study of the loads was made before installing the motors.

E. S. Lammers, National Tube Company, said he was anxious to have motors large enough to meet the varying conditions in a steel mill. D. Kendall, Alliance Machine Company, said that in selecting crane motors he always purchased a motor larger than that recommended to make sure that the motor would handle any load. First cost, he stated, is unimportant in steel mills compared with continued output. The M. A. Hanna Company, according to C. H. Matthews, its electrical engineer, used both types satisfactorily, but the applications were carefully analyzed before the motors were bought. A. W. Mohrman, Trumbull Steel Company, said it was impossible to foretell the actual load. The duty cycle and not temperature should determine the motor type, according to S. L. Henderson, American Steel & Wire Company.

In addition to the discussion by the users, representatives of a number of prominent motor manufacturers who were present gave a bird's-eye view of the manufacturers' feelings on this subject. In reading the paper on which the discussion took place L. F. Adams, electrical engineer of the power and mining department of the General Electric Company, advocated the 50-deg. motor because it puts the responsibility of selection and operation on the buyer. He stated that the New England Power Company recently found that the majority of its motor installations were overmotored 20 to 25 per cent. Investigation of 743 plants in the West showed 80 per cent of the motors underloaded, 10 per cent carrying rated load and 10 per cent overloaded from 1 per cent to 13 per cent. He claimed that the A. I. E. E. rules allow for a room temperature of 40 deg. C., while the room temperature is seldom actually above 21 deg. C. The French and Germans, he stated, have made 50-deg. motors successfully for several years and the English are now adopting this standard.

J. M. Hipple, design engineer of the Westinghouse Electric & Manufacturing Company, said that lack of education and misunderstanding of the phraseology were obstructing the adoption of the 50-deg. motor.

S. C. Schum, design engineer for the Burke Electric Company, which makes both types, expressed a personal opinion that the 50-deg. motor will ultimately be generally used.

C. L. Collins, president of the Reliance Electric & Manufacturing Company, claimed that proper education as to the application of 40-deg. motors would effect the same saving as could be shown with a 50-deg. motor. He believed the distinction in ratings was more logical for direct than for alternating-current machines.

A. C. Bunker, design engineer of the Crocker-Wheeler Company, claimed the Institute rules set the upper limit of temperature rise and that a conservative limit did not permit a 50-deg. rise. Motor installation costs, he estimated, were only 5 per cent of total factory investment and any saving by installing a motor of higher rating would be comparatively inconsiderable. He stated that any motor was expensive if it broke down frequently and therefore it should not be operated at the ultimate limit of temperature.

Noble Duff and D. B. Wilson of the Electro-Dynamic Company said that their company believed in the 40-deg. machine and kept the operator in mind when making the application, remembering that the load usually increases after some time.

The Lincoln Electric Company, said A. P. W. Smith, preferred a 40-deg. rating, and, as the company's engineer actually made each application, the company assumed the responsibility.

Harry W. Eastwood of the Cutler-Hammer Company said that a 40-deg. motor allowed for a factor of safety that was advantageous.

Detroit Edison's New Rates Reflected November Statement

NOVEMBER is the first month to reflect the full effects of rate increases of the Detroit Edison Company and the removal of restrictions on power users by the placing in service of a new 45,000-kw. turbine and another turbine of the same size which was rebuilt after the accident in July. Both of these machines are operating smoothly, and the company has available sufficient generating capacity to meet present requirements and continue the overhauling of equipment necessitated by previous overloading.

For the month of November this year the total gross revenue was $2,176,859.02, compared with $1,615,615.25 for the same month in 1919, an increase of 34.7 per cent.

Total gross revenue of the company as shown by the consolidated earnings and income statement for eleven months of this year was $19,660,624.49, as compared with $14,746,417.16 for the same period of 1919, an increase of 33.3 per cent. Total operating and non-operating expenses, not including interest on funded and unfunded debt, were $15,829,425.86 for the eleven months, against $10,989,383.49 a year ago, showing an increase of 44 per cent. Interest was $2,207,606.25, an increase of 41.2 per cent, leaving a net of $1,623,592.38, a decrease of 26 per cent.

Missouri Commission Advances Rate Base from 7 to 7½ per Cent

AN IMPORTANT change in what has been the fixed policy of the Missouri Public Service Commission in basing utility rates on a return of 7 per cent less depreciation has been announced by that commission. The commission has changed this rule because of the advance in interest rates and has established 7½ per cent as the new basis. The commission notes in a decision upon lighting and commercial rates at Warrensburg, handed down last week, that since last February interest rates have advanced to such an extent that current rates on good security are 8 per cent and the largest public utilities in the state are paying from 8 to 9½ per cent interest in refinancing their properties.

In the Warrensburg case the commission allowed the company to increase its minimum monthly charge from $1 to $1.50 in order to increase its earnings $13,761 a year and bring the returns on the investment of something over $154,000 up to where the company will earn 7½ per cent on the investment.

Boston Societies Hold Joint Meeting on Water Power

WATER-POWER development in New England was the topic at a joint meeting in Boston on Friday evening of this week of the Boston Sections of the A. I. E. E. and the A. S. M. E. and the Boston Society of Civil Engineers. Prof. Harold K. Barrows was to give an illustrated paper on the subject and Henry I. Harriman, president of the New England Power Company, was to speak on the project for the development of the St. Lawrence River. This meeting was the first of three arranged by the three societies for joint discussion of water power. The second will be held in the latter part of January and the third in February. The meeting just held was under the auspices of the civil engineers; the second and third will be directed respectively by the electricals and the mechanicals.

The Boston Society of Civil Engineers was to vote yesterday, previous to the joint meeting, on resolutions strongly supporting efforts being made by the New England Conference for the Protection of National Parks to amend the water-power act.

New Officers of American Engineering Standards Committee

AT THE annual meeting of the American Engineering Standards Committee in New York on Dec. 4, A. A. Stevenson, representing the American Society for Testing Materials, was re-elected chairman for 1921, and George C. Stone of the American Institute of Mining and Metallurgical Engineers was re-elected vice-chairman. The following were also elected to represent the respective member bodies on the executive committee: Comfort A. Adams, American Institute of Electrical Engineers; Martin Schreiber, American Society of Civil Engineers; Fred E. Rogers, American Society of Mechanical Engineers; A. H. Moore, Electrical Manufacturers' Council; Dana Pierce, fire protection group; A. Cressy Morrison, gas group; N. A. Carle, National Electric Light Association; Albert W. Whitney, National Safety Council; Coker F. Clarkson, Society of Automotive Engineers; Thomas H. MacDonald, United States Department of Agriculture; E. B. Rosa, United States Department of Commerce; O. P. Hood, United State Department of Interior; Francis J. Cleary, United States Navy Department; J. H. Rice, United States War Department.

Washington Water Power Expanding

OWING to heavy power demands the Washington Water Power Company will begin at once construction on its fifth plant on the Spokane River. This plant, which will develop 14,000 hp., will bring the company's installation up to 125,000 hp.

In speaking of the projected improvement, President Huntington said: "This construction is being undertaken at this time, in spite of the high cost of money and materials, because the company wishes to maintain its reputation for taking care of all the business in its territory. Naturally the company hesitates to increase its plant under the unfavorable condition of the money market and material and machinery costs, but we feel that the demands for power demand such a step at this time."

Regulation of Coal Industry Recommended

A SEVERE arraignment of the coal industry was made before the United States Senate this week in a preliminary report of the Senate committee on production and reconstruction headed by Senator Calder of New York. This committee, which has been investigating the coal situation for some time, recommends regulation of the coal industry to cure existing evils. The repudiation of coal contracts, high prices and irregularity of deliveries were sharply criticised.

The text of the coal section of the report is as follows:

National development depends upon an ever-increasing supply of power. Heat is as necessary for production, in fact, for human existence, as is air or water; its use must be continued from day to day and cannot be deferred or interrupted.

The nation is dependent upon coal as its chief source of heat and power, yet the production and distribution of coal are badly organized and subject to manipulation at the expense of the people.

Coal profiteering, especially as it has followed the priority orders issued by the Interstate Commerce Commission, has continued unchecked by the Department of Justice and is a national disgrace. Coal speculation has been permitted to monopolize the transportation facilities of the country, retarding necessary construction and increasing the basic cost of manufacture and distribution of commodities in general. It has bled the home owners, public utilities, and the industries.

The imperative necessity of continuity of supply of fuel demands the fulfillment of contractual relations in this industry more than in any other, and yet one of the primary causes for the disgraceful and disastrous conditions during the past six months has been the repudiation of contracts. An exceptional demand not only brings about reckless and unwarranted repudiation of contracts made for delivery of coal but the substitution of inferior quality at higher prices. Indeed, coal contracts are so drawn as to be breakable in delivery, in quality and in price.

Our investigation into the coal situation has convinced us that the private interests now in control of the production and distribution of coal, in spite of efforts by some, are actually unable to prevent a continuance or a repetition of the present deplorable situation, and that it is the duty of the government to take such reasonable and practical steps as it may to remedy the evil.

An inherent responsibility of the government is the protection of its people. To assure the mining, transportation and distribution of coal at fair prices is a public

The "Electrical World" Street-Lighting Tables for 1920

FOLLOWING its practice for thirty-two consecutive years, the ELECTRICAL WORLD has prepared tables showing the proper time for lighting and extinguishing street lamps. The 1920 tables are now ready, and a copy will be sent free to any reader upon request to the ELECTRICAL WORLD, Tenth Avenue at Thirty-sixth Street, New York. For more than one copy a charge of 10 cents per copy is made.

duty from which the government cannot escape. But your committee believes that governmental administration of the production and distribution of coal should be a last resort, as governmental activities should always be directed toward encouragement of private initiative and enterprise.

While the fulfillment of contractual relations is of first importance to the stabilization of the industry in the interest of the consumer, the producer, and labor as well, your committee believes that the government should at all times be informed as to coal distribution and recommends:

That all coal operators, wholesalers, jobbers and retailers be compelled by statute to file at regular and frequent periods with some federal agency reports on the total tonnage produced or handled, the size and quality thereof, the amount of tonnage contracted for, the amount sold on contract and at spot sale, to whom, together with the prices made or received under such contracts or sales, and producers and distributers to make regular reports sufficient to determine their costs and profits and the corporate interrelations or the communities of interest, if any, between companies producing and distributing coal.

Fuel thrift by the small user and fuel thrift by the large user through storage, scientific combustion, and transmission should be strongly encouraged by the government.

Massachusetts Utilities May Ask Right to Issue Stock for Premiums

MARKETABILITY of Massachusetts public utility stock has been greatly handicapped by the requirement that stock shall be issued at as high a premium as the market will take. Central stations in that state are at present preparing to present to the next Legislature a bill enabling utilities to issue stock to the amount of premiums appearing in the balance sheet. In the case of the Edison Electric Illuminating Company of Boston, for instance, which will be one of the companies affected, the paid-up value of the stock is 180. Should the contemplated legislation be enacted, it would involve in the case of the Boston company an 80 per cent stock dividend.

Toronto Power Situation Cleaned Up

AFTER two years of negotiations, Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, on Dec. 4 concluded an agreement with representatives of Sir William MacKenzie to purchase for $32,734,000 the entire electrical interests of the various companies promoted, controlled or influenced by him in the Toronto and Niagara district. Sir Adam acted on behalf of the city of Toronto and the other Ontario municipalities composing the Hydro-Electric Power Union.

The properties purchased are the Toronto Power Company, the Toronto & York Radial Railway and the Schomberg & Aurora Railway lines, which three properties compose the Toronto Power Company; the Toronto & Niagara Power Company, the Electrical Development Company and the Toronto Electric Light Company.

The purchase will be financed as follows: The consideration is to be $6,971,295 of 6 per cent twenty-year bonds of the city of Toronto, $2,375,000 twenty-year bonds of the Hydro-Electric Power Commission, $613,528 twenty-year 5 per cent bonds of the commission and the assumption by the commission of the underlying bonds of the Toronto Power Company of $4,355,000, $13,558,917 bonds or debenture stock of the Toronto Power Company, $4,103,200 5 per cent mortgage bonds of the Electrical Development Company, $840,000 three-year 6 per cent notes of the Toronto Electric Light Company, and $13,100 outstanding stock of the Electrical Development Company—making up the following total: Bonds to be delivered, $9,958,823; obligations to be assumed, $22,775,177, a total price of $32,734,000.

The consummation of this large deal was virtually made necessary because of existing franchises if the undertaking of the proposed Hydro-Radial railways was to be gone on with. By the acquisition of the foregoing power plants the Hydro-Electric Power Commission becomes the largest generating and distributing concern in the world. The total capacity of the plants owned, acquired and under construction will be more than 1,000,000 hp. The total investment by the end of 1922 will be between $160,000,000 and $170,000,000 by the Province of Ontario and the municipalities.

The capital cost of the power supplied by the Ontario Power Company, which was acquired by the commission over a year ago, is between $125 and $130 per horsepower, and the investment cost of power generated by the Electrical Development Company (the MacKenzie power plant at Niagara now acquired by the above purchase) is from $130 to $135 per horsepower.

The contracts of the Electrical Development Company and the Toronto Electric Light Company will be carried out by the Hydro-Electric Power Commission, those in the city of Toronto remaining under the present prices until the termination of the Toronto Railway franchise in September next. The Toronto Railway Company is now paying $25 per horsepower per annum.

The public-owned Hydro-Electric system nas been in actual operation for ten years. The only power system in Ontario which is not now publicly owned and operated is that of the Dominion Power & Transmission Company of Hamilton.

Ontario Hydro Awards $2,000,000 Worth of Contracts

CONTRACTS amounting to almost $2,000,000 were awarded at a special meeting of the Ontario Hydro-Electric Power Commission on Dec. 10. The contracts covered transformers, electrical equipment, cement and other materials needed in the construction of the Chippawa Canal power development. The purpose in awarding them at this time, it was stated, is to assist activity in the manufacturing industries affected and supply additional employment during the present winter.

Sir Adam Beck, chairman of the commission, before leaving for England said that the power supply now seems sufficient at least for all manufacturers depending on power in the Niagara district and should continuously meet all their requirements except that there may be short-time interruptions on account of ice, should the winter prove a severe one.

Great Falls Development Awaits Action of Congress

APPLICATION by Baltimore interests for permission to build two dams across the Potomac River above Washington had led the Federal Power Commission to announce that no action will be taken on this matter until Congress has acted on the proposed power development at Great Falls. The report by the corps of engineers on the Great Falls project will be submitted before Christmas, it is believed.

Seattle Municipal Plant to Install Stokers to Guard Against Fuel Shortage

APPROVAL has been given by the Seattle (Wash.) Board of Public Works to the plan to equip four of the fourteen boilers at the city's Lake Union steam plant with stokers at a cost of $150,000. The Seattle municipal plant now burns oil. It is claimed by Superintendent of Lighting J. D. Ross that a saving of more than $150,000 a year will be effected through the installation of the four stokers, which will permit the use of mill refuse, coal or oil. These fuels may be used separately or may be used at the same time.

Advertised Water Powers

WATER-POWER projects ordered advertised by the Federal Power Commission during the week ended Dec. 4, with the final date for filing objections, are as follows:

R. W. Hawley, Commercial Building, San Francisco; Silver Creek; Feb. 28.

Roanoke River Development Company, Richmond, Va.; Roanoke River at Buggs Island; Feb. 24.

Snow Mountain Water & Power Company, Standard Oil Building, San Francisco; dam and reservoir in South Fork of Eel River, Lake County, Cal.; Feb. 24.

Henry Ford & Son, Inc., a New York corporation; Troy dam (the application in this project originally was made by the Ford Motor Company of Delaware); Feb. 15.

Central Credit Men Celebrate Twenty-five Years of Association

TWENTY-FIVE years of credit service to the electrical industry were commemorated by the Electrical Credit Association, central division (previously known as E. C. A. of Chicago), at its silver jubilee meeting, held at the Congress Hotel, Chicago, on Dec. 9 and 10. More than 300 members and their guests were present, and they represented thirty-four different cities in the central division. The accomplishments of the past were recounted by Frederick P. Vose, secretary and treasurer of the association since its inception, and still greater possibilities for the association in the future were suggested in an address by Howard A. Lewis, advertising director of ELECTRICAL WORLD, *Electrical Merchandising* and *Journal of Electricity*. The use and abuse of trade acceptances and an adequate accounting system for contractors were also discussed.

Nine past-presidents were at the banquet on Thursday evening, when the membership at large took the opportunity of presenting Secretary-Treasurer Vose with a chest of flat silver and a silver dinner service as an expression of appreciation of his twenty-five years of service to the organization.

B. P. George, treasurer of the Beardslee Chandelier Manufacturing Company, Chicago, was elected president of the organization for the ensuing year, and A. F. Hearl of the American Electric Supply Company, Chicago, was re-elected vice-president.

Paper Manufacturers Purchase Controlling Interest in Utility Company

CONTROLLING interest in the Northern New York Utilities, Inc., of Watertown, N. Y., has been purchased by a syndicate of paper manufacturers headed by the St. Regis Paper Company. Included in the syndicate are also Harry S. Lewis of Beaver Falls, the Remington Paper & Power Company, the Champion Paper Company, Taggart Brothers Company, the Harmon Paper Company and the Warren Parchment Company. The Northern New York Utilities has nine hydro-electric plants totaling 30,000 hp. and operates 47 miles of steel-tower transmission line. These are to be consolidated with the power development of the paper companies.

In a statement regarding the consolidation, Floyd L. Carlisle, president of the St. Regis Paper Company, said: "The purchasers are the owners of large undeveloped water powers which it is believed will be developed in connection with the utilities company, and transmission lines will be greatly extended. The combined developed and undeveloped water powers of the utilities company and the purchasers are from 150,000 hp. to 200,000 hp., which will make it one of the largest ownerships of hydro-electric power in the eastern United States."

Mexico Has Plans for 100,000-Hp. Plant on Sonora River

THE State of Sonora, Mexico, according to Governor Pablo Borquez, has made considerable preliminary progress toward the construction of a great hydro-electric and irrigation project on the Sonora River at a point about 75 miles from Hermosillo and 10 miles from Ures. When finished the storage reservoir will provide water for irrigating 750,000 acres of land. Although no authoritative estimate has as yet been made of the amount of electric power to be generated, it is stated that it will be not less than 100,000 hp.

The dam at El Puerto del Sol, near Ures, will, according to the engineers' report, be 180 ft. high, 800 ft. long at the top and 200 ft. long at the bottom, including a large pipe of cement and masonry 130 ft. in thickness at the base. Construction of this dam will be followed by others until the entire project is completed on the unit system. The second dam and reservoir will be built near Ryon, on the San Miguel River.

Signal Corps Asks Congress for $10,697,000

THE Chief Signal Officer of the army has requested appropriations for the next fiscal year aggregating $10,697,000. This sum is to be used largely in the equipment, operation and repair of military, telegraph, telephone, radio, cable and signaling systems, electric time service, the rental of commercial telegraph lines and equipment, electrical installations and their maintenance at military posts, and the employment of the necessary personnel.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

A South African Project.—An official report to the South African government mentions a plan to develop electrical power at the Kroonstad colliery, whose product is a steam coal of too low quality to compete with better fuel except close to the mine. The scheme is to transmit the power developed through the Orange Free State, with a line to the diamond mines of Kimberley. It is thought that rapid industrial development of a huge tract of country now given up to agricultural pursuits would follow.

Alabama Power Company's Duncan's Riffle Development.—According to an announcement concerning plans of the Alabama Power Company, its application to the Federal Power Commission for permission to construct a dam and power plant at Duncan's Riffle, on the Coosa River, 14 miles below its present development at Lock 12, foreshadows an ultimate installation of 120,000 hp., of which 50,000 hp. will, by the company's plans, be ready in two years. The present Lock 12 development of 90,000 hp. is being increased by 20,000 hp., and the new unit is to be ready next year.

Industrial Lighting Exhibit Opened in San Francisco.—The industrial lighting exhibit which has been installed by the California Electrical Co-operative Campaign with the assistance of the Industrial Accident Commission of the state in the rooms of the commission in San Francisco was opened to the public on Nov. 22. In addition to showing industrial plants the benefits of better illumination, the exhibit will serve to explain and clarify the lighting safety orders recently placed in effect in California by the Industrial Accident Commission. These lighting orders apply in all places where industrial work is conducted and are intended to reduce eye strain and promote the safety of employees as well as to point a way toward increased production.

Electricity in the Spelter Industry of Tasmania.—Last year the government of Tasmania proposed to expend £500,000 in utilizing the water power of Lake Rolleston to produce 50 tons of spelter a day from the zinc mines on the west coast of the island. This scheme has now been dropped, but the mines have been taken over by a company already producing zinc in New South Wales from ores mined there, and the zinc concentrates produced in Tasmania will be shipped for treatment to its plant at Hobart. The government is to purchase and transmit to the Tasmania mines about 1,500 hp. of electrical energy for operating and other purposes.

Westinghouse Company Employs Students on Part Time.—In order that engineering students of the University of Pittsburgh and the Carnegie Institute of Technology may be able to gain practical knowledge regarding the production and testing of electrical apparatus and at the same time earn extra money, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has initiated a part-time employment plan. Students are allowed the regular hourly rate for work on Saturday afternoons, Sundays and holidays. For the most part the employment consists of storekeeping, which allows the students to become familiar with the size and character of the different kinds of electrical apparatus.

Electrical Operation for Oil-Field Development.—According to an Austin (Tex.) dispatch to the *Manufacturers' Record*, electrical equipment is rapidly replacing steam drive in the oil fields. The saving in fuel alone has been found to pay for the installation of complete electric generating and distributing plants within a remarkably short period, and it is predicted that within a few years all fields except those having an abundant supply of gas will be electrically equipped. Special attention is called to the large salvage value of electrically operated developments over others in cases where fields have to be abandoned. There is besides a great saving in field operations with the elimination of the extension of steam and water lines and of the need for other steam equipment. As yet the actual work of drilling has not been done with electric drive in the fields especially referred to, but this is thought not to be far off.

Electrical Engineering Section of Signal Corps.—In his report to the Secretary of War for 1920 Major-Gen. George O. Squier, Chief Signal Officer, U. S. A., summarizes the recent work of the engineering section of the Signal Corps. A light wire has been produced adapted to field telephone and telegraph work, but as its high quality could not be maintained were a heavy output necessary, work along this line still continues. Good progress is reported in the production of an entirely satisfactory kite-balloon telephone set and of a lead-zinc battery for emergency storage. Experiments in the adaptation of the German buzzers and induction coils of which models were captured in the war are being conducted, work on a field multiple switchboard is being carried on, field telephones are being remodeled, and a universal test set for the use of linemen in the field has been designed and is being produced in quantity. Hand and horse-drawn wire carts have been improved and other mechanical devices perfected. A satisfactory flashlamp model has been furnished, and a simplex telegraph set for use on telephone wires has been developed.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

St. Louis Section, A. I. E. E.—Automatic substations were to be discussed by R. J. Wensley, switchboard engineering department of the Westinghouse Electric & Manufacturing Company, before this section of the Institute on Dec. 17.

Institute Meetings.—The three hundred and sixty-sixth meeting of the A. I. E. E. will be held at Akron and Cleveland, Ohio, on Jan. 14. The Goodrich rubber plant in Akron will be inspected in the afternoon and a technical session on "Rubber-Mill Electrification" will be held at Cleveland in the evening. The date for the midwinter convention of the Institute at New York has been changed from Feb. 23-25 to Feb. 16-18.

Association of Iron and Steel Electrical Engineers.—Tonight (Dec. 18) the Pittsburgh Section of this association will listen to a paper on "Electric Welding, Spot and Butt," by Gordon Hughes, Truscon Steel Company, Youngstown, Ohio. On Monday, Jan. 10, the Cleveland Section will be addressed by L. A. Heath, engineer Morganite Brush Company, New York, and John S. Cavitt, sales engineer and secretary Electrical Engineering & Manufacturing Company, Pittsburgh, on "The Proper Selection of Carbon Brushes." At the Philadelphia Section meeting on Jan. 8, as announced last week, power-factor correction will be discussed. Other meetings of this association are announced for the following dates: Pittsburgh, Jan. 15; Chicago, Jan. 15; Birmingham, Jan. 27; Philadelphia, Feb. 5; Cleveland, Feb. 14. The programs will be announced in this column later.

Coming Meetings of Electrical and Other Technical Societies

Association of Iron and Steel Electrical Engineers—Pittsburgh Section, Dec. 18; Philadelphia Section, Jan. 8; Cleveland Section, Jan. 10; Chicago Section, Jan. 15; Birmingham Section, Jan. 27.

American Association for the Advancement of Science—Chicago, Dec. 27-Jan. 1.

American Physical Society (annual meeting)—Chicago, Dec. 28-Jan. 1.

American Institute of Electrical Engineers—Akron-Cleveland, Jan. 14; Cleveland Section, Dec. 21; Seattle Section, Dec. 21; Portland (Ore.) Section, Jan. 10; Boston Section, Jan. 11; Pittsfield Section, Jan. 20; Chicago Section, Jan. 24.

Wisconsin State Association of Electrical Contractors and Dealers—Milwaukee, Jan. 19 and 20.

American Washing Machine Association—Chicago, Jan. 19 and 20.

American Society of Civil Engineers—New York, Jan. 19.

Western Association of Electrical Inspectors—Detroit, Jan. 25-27.

Association of Municipal Electrical Utilities of Ontario—Toronto, Jan. 27 and 28.

A. I. E. E. (New York Section) and A. S. M. E. (Metropolitan Section)—New York, Jan. 28.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Contributory Negligence in Vermont.—It is the law in Vermont, the Supreme Court holds (Bianchi vs. Millar), that there can be no recovery for injury if plaintiff's negligence contributed in the least degree to the accident. (111 At. 524.)*

Specific Complaint in Damage Suit.—A complaint that an employing company failed to insulate and guard its electrical appliances and negligently failed to warn an employee who was not an electrician of the danger, and also failed to turn off the electric current while this man was working in proximity to live apparatus, stated a cause of action, according to the finding of the Appellate Court of Indiana in Haskell & Barker Car Company vs. Erickson. The court therefore refused to reverse the verdict against the company, which had appealed to it because the trial court had overruled its motion to make the complaint more specific. (128 N. E. 466.)

Fourteen-Year-Old Law Becomes Confiscatory.—By confirming with unimportant modifications the report of a special master appointed to investigate the questions at issue in Kings County Lighting Company vs. Nixon, the United States District Court for the Southern District of New York has declared unconstitutional because confiscatory the "80-cent gas rate" laws passed by the New York Legislature in 1906 and 1916, and an injunction against their enforcement by the Public Service Commission was accordingly granted. While refusing to fix or suggest, directly or indirectly, a proper rate for gas, the court hinted at its power to vacate its own injunction should the plaintiff endeavor to charge an inequitable rate.

Value of Franchises in Rate Fixing.—In handing down the decision of the United States District Court for the Southern District of New York in Consolidated Gas Company vs. Attorney-General, Judge Learned Hand made these observations respecting franchise value: "If the franchise gets a value because the rates have not been controlled, the 'reasonable expectation' of their continuance is without basis, and that is the only possible ground for a vested interest in such rates. The inaction of the authorities in the past gives no prescription, and without such prescription the franchise can have no capital value unless the very point is assumed. That the franchise has a kind of value is, of course, true enough; it alone protects the 'tangibles' from becoming junk; but as a part of the 'rate base' it should never figure." (267 Fed. 231.)

Illegal Action by Commission Overruled.—The Supreme Court of North Dakota has held, in a suit of the state against the Chicago & Northwestern Railway Company, that a rate order issued under the seal of the Board of Railroad Commissioners and signed by the secretary is void for lack of proper action, the hearing having been attended throughout by only one and a part of the time by two of the three members of the board and no vote having been taken at a subsequent meeting of the board, although it was claimed that an agreement had been reached. The requirements of the statute, the court held, had not been complied with; excess fares received by the railroad must be refunded and a rehearing held. (179 N. W. 378.)

No Obligation on Company to Guard Transformers.—In overruling exceptions taken to the ruling of the lower court in Robbins vs. Minute Tapioca Company and Athol Gas & Electric Company the Supreme Judicial Court of Massachusetts declared that neither a manufacturing company making use of transformers nor a power company which maintained these transformers on the manufacturing company's premises was under duty to a boy on the premises, he being a trespasser, or at most a licensee, to inclose or otherwise guard the transformers. The suit was for damages because of the death of the boy, who deliberately touched wires entering the transformer. The only duty of the companies to the boy was to abstain from reckless conduct likely to injure him. Questions as to the safety of the installation addressed to an expert were rightly excluded, that being a question for the jury, which had all the facts. (128 N. E. 417.)

Principles Applying to Determination of Present-Day Rate Base.—It was found by the United States District Court for the Southern District of New York in a suit brought against the Attorney-General of the state by the Consolidated Gas Company that a period of two years, despite the conditions produced by the war, is sufficient for the calculation of the cost of production and the rate base of a public utility for a future time long enough to call for judicial action. In the determination of the rate base a utility company is entitled to the increased value of capital due to the increase in present cost of production, since the increased valuation of the capital will, for the years of the depreciated dollar, leave the company exactly as it was. The proper standard for the rate base being the present cost of a substitute plant of equal capacity, age of the present plant should not be a function in the rate base, although in computing the rate base from the original cost depreciation is of vital consequence. (267 Fed. 231.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Cost of Money and Comparison of Return.—The increase in the cost of money and in the return realized by investors in industrial securities with which public utility securities must compete in the money market is not, in the opinion of the Indiana Public Service Commission, sufficient to justify an increase in the rate of return from 7 to 8 per cent in the case of a utility which pays but 5 per cent on all the money invested in its plant.

Surrendering Franchise in Return for Indeterminate Permit.—In granting increased rates temporarily to the Hope Electric Plant the Indiana Public Service Commission asserted that the company had not surrendered its franchise in return for an indeterminate permit because it had not followed the procedure for accomplishing this end laid down in the statute, but the commission further declared that it has power in an emergency temporarily to alter existing rates even where they are fixed by an unsurrendered franchise. A coal cost of 9 cents a kilowatt-hour was pronounced to be "ultra-excessive" and to indicate inefficiency.

Adequate Street Lighting a Public Necessity.—The Pennsylvania Public Service Commission has ordered the Duquesne Light Company to install seven additional lamps on streets in the township of Penn, notwithstanding that by its contract with the township the company is obligated to install additional lamps only when their distance from one of its circuits will not be more than 500 ft., whereas in the case at issue the distance is 617 ft. The commission held the extension requested by the township to be a public necessity and that the installation of the lamps would not impose an undue burden on the company.

Powers of Nebraska Commission—Illegality of Utility Strikes.—The Nebraska State Railway Commission enjoys, it asserts, jurisdiction on a different footing from that of most regulating bodies in that its powers are not limited except as the field may be occupied by legislation or the matter may be beyond the control of the people themselves. It therefore claims the power to fix a wage scale for street-railway employees adequate to attract efficient men and prevent interruption of service. The state having provided a tribunal for the adjustment of wage disputes, the employees of a street railway, who have undertaken equally with the stockholders of the company to serve the public, cannot lawfully agree to strike.

Page Golsan, formerly assistant to the president of the Great Western Power Company, San Francisco, Cal., and consulting engineer for the Fleishhacker interests and of the Western office of C. B. Peters Company, Inc., exporters, has resigned these positions to become associated with the engineering firm of Ford, Bacon & Davis, New York.

Daniel N. Peirce is now associated with the engineering department of the Philadelphia Electric Company, where he is doing special work. Mr. Peirce has in recent years been largely engaged in newspaper and publication work. Prior to that he was engaged in the engineering department of the Bell Telephone Company of Chicago.

W. H. Glenn, vice-president of the Georgia Railway & Power Company, Atlanta, Ga., tendered his resignation on Dec. 1, in order to assume the presidency of the Shippers' Warehouse Company, a cotton-compressing and warehousing corporation. Mr. Glenn was associated with the Georgia Railway & Power Company for twenty-nine years, during which time he has been connected with the street-railway end of the company's business.

Charles Lyman Rand, secretary and chief chemist of the Mitchell-Rand Manufacturing Company, New York, manufacturer of electrical insulation products, has relinquished his duties as factory superintendent to devote his entire time to important research work in the chemical and allied fields for his company. He will be succeeded as factory superintendent by Joseph T. Lawrence, chemical engineer, formerly associated with E. I. du Pont de Nemours & Company.

T. W. Flowers has resigned as secretary and treasurer of the Cohoes (N. Y.) Power & Light Corporation to become associated with the J. G. White Management Corporation as assistant auditor of the Manila (P. I.) Electric Company. Mr. Flowers has been associated with the accounting section of the electric industry for the past twelve years, entering the business with the Brooklyn Edison Company. He occupied the position of general accountant for that company on Dec. 1, 1918, when he resigned to go to Cohoes.

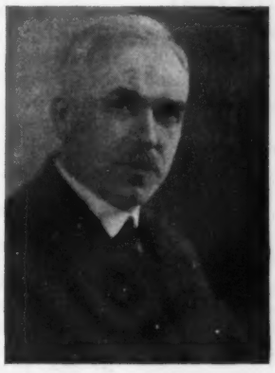
Ernest Hagenlocker, for the past year and a half associated with Frazar & Company, New York, exporters and importers, has been transferred to the Tokio (Japan) office of Sale & Frazar, Ltd. He will be connected with the engineering department of that firm, handling design and specification work, particularly of machine tools and locomotives. Mr. Hagenlocher was a member of the engineering staff of the J. G. White Engineering Corporation for five years, during which time he served as resident electrical engineer on the United States Nitrate Plant No. 1 at Sheffield, Ala. He was graduated from the University of Pennsylvania in 1911 and for two years acted as instructor in electrical engineering at that university.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

W. T. O'Connell has resigned as estimator and designer for the electrical division of the Panama Canal to enter the construction engineering department of the General Electric Company of Schenectady, N. Y.

O. P. Hood, the chief mechanical engineer of the United States Bureau of Mines, has been appointed the representative of that bureau on the Superpower Survey. He brings to the organization a familiarity with many of the mechanical problems involved in the plan. In addition, he has an intimate knowledge of fuel utilization and of the by-products industry.



O. P. HOOD

C. M. Harris, heretofore manager of the railroad shop section of the industrial department, Westinghouse Electric & Manufacturing Company, has been appointed vice-president of the Hagerstown & Frederick Railways Company, which operates interurban railways and central stations in Maryland. Mr. Harris was graduated from Pennsylvania State College in 1901 as an electrical engineer and has handled the electrical business of the Westinghouse railroad shops for a number of years. He was made manager of the railway shop section, industrial department, last spring.

J. G. Menut has been appointed general manager of the Vermont Hydro-Electric Corporation, with headquarters at Rutland, Vt. Mr. Menut is a native of Vermont and has had more than twenty years' experience in public utility administration. For the past year he has been at Easton, Pa., as manager of the Pennsylvania Utilities Company and Easton Gas Works. Prior to that period he was general manager of the Colonial Power Company and Claremont Power Company, of Springfield, Vt., and Claremont, N. H., since merged with the Vermont Hydro-Electric property. The local central-station property at Rutland will also be under the general management of Mr. Menut.

George N. Brown, until recently electrical engineer of the New York State Railways, Syracuse-Utica lines, has been appointed district manager of the New York office of the Pittsburgh Transformer Company. Mr. Brown came to his new position from the engineering department of the Brooklyn Edison Company. Twelve and a half years ago he was graduated from Cornell University, where he took a course in electrical engineering. He immediately thereafter began railway work. In November, 1910, he became connected with the Boston & Maine Railroad and took part in the Hoosac tunnel electrification, afterward acting as switchboard operator in the North Adams power plant. In May, 1912, he became assistant engineer of the three lines which now form the Syracuse-Utica division of the New York State Railways. He was later promoted to be electrical engineer of these lines. During the war Mr. Brown served as a first lieutenant of engineers and was later promoted to the rank of captain. He went overseas in the spring of 1918 and was with the British in Flanders and later with the American Expeditionary Force at St. Mihiel and in the Argonne.

Obituary

Ernest R. Woodbury, manager of the Salem (N. H.) Electric Light Company, died recently at his home in Salem.

John Guest, the patentee of an arrangement for leading wires into incandescent lamps to conserve platinum, died Nov. 29, at his home in Brooklyn, N. Y.

Frederick B. Eaves, assistant general sales manager of the Bryant Electric Company, Bridgeport, Conn., died suddenly on Dec. 12. Mr. Eaves was a graduate of Harvard University, class of 1905, and had been connected with the Bryant company for over nine years. Until 1918 he was field representative of the company in New England and New York State. During the war he served in the electric power and equipment division of the War Industries Board, having charge of the question of essentials as it related to the electric jobbing industry of the country. Soon after the signing of the armistice he returned to the service of the Bryant company, and in 1919 he made an extended trip through Europe as a special representative of the company's export department.

Trade and Market Conditions

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Pamphlets on Trade Acceptances for Distribution

IN ITS endeavor to assist in every way possible at this time of credit strain, when it is needful for banks and business men to have their assets in liquid shape, the American Acceptance Council announces that it has for distribution a comprehensive series of pamphlets on bankers' and trade acceptances. These publications may be purchased and copies are available in small or large quantities upon application to the council. For some time the electrical industry has been using trade acceptances to a certain degree and to a constantly increasing extent, but without doubt their use would become more general were the trade more familiar with their workings and advantages. One method for gaining this familiarity is that here outlined.

Favorable Outlook Seen in Cotton Belt

ONE of the foremost electrical supply jobbers in the Southern cotton belt, in looking forward into the coming year, has sounded a rather optimistic note as regards business in the electrical industry in that section in the near future.

"We believe that the outlook in our territory for 1921 is good," he says. "Cotton is the foundation of everything, but cotton prices, although low, seem to have reached the bottom and a certain amount of stability is bound to exist. Operations which ceased temporarily must be resumed even on a lower economic basis, and the resumption of work compels necessary purchasing at least.

"Electrical apparatus and electrical devices bear an important part in operations and in the daily life of the operators and the farmers. The market for these will continue to be on the increase until the field is more thoroughly developed than at present. The period of education is in full swing in this section of the country, whereas in the North the education is nearer completion. The North has more nearly reached the point of saturation, while in the South they have just begun to climb."

German Manufactures Showing Up in Foreign Trade

TO SHOW the extent to which German electrical manufacturers have come back into their export market, recent reports show a few interesting contracts which have just been closed by German manufacturers to supply electric materials for foreign use. The German-Chilean firm Saavedra Bénard, representing the Maschinenfabrik Augsburg-Nürnberg A. G., has closed a contract with the Chilean government for eight electric cranes of 3-ton capacity each and fourteen cranes of 1½-ton capacity. These are intended for use in the harbor of Valparaiso, and the purchase price is given as 1,200,000 gold pesos. This is said to be the first large government order from Chile since the war. The Norddeutsche Seekabelwerk Noordam has received an order from the Dutch government for cables for the Dutch Indies, which will keep the works fully employed for several months.

An order for electric cables from the Swiss government has been placed with Siemens & Halske, amounting to 2,500,000 francs. This order has been given for immediate delivery. It is stated that Siemens & Halske had the cables ready for the German Telegraph Administration, which, however, withdrew from the contract in favor of the export to Switzerland.

The same company has received a large order for electric machinery for Chinese mines, railroads and industrial establishments. This order has been secured in competition with American, English and French manufacturers, which have been considerably underbid by Siemens & Halske.

The A. E. G. has received an order from the north of England for electric material amounting to £200,000, to equip a plant with generators, motors, switchboards and other apparatus. Another English order has been given to the Orenstein & Koppel A. G. for mine equipment and narrow-gage railroads, and still another to the Linke-Hoffman Werke, one of the largest railway-car building works in Germany, for special-purpose machinery.

For the Russian Soviet government the German electrical industry has also lately received orders which have aroused considerable attention. Among these was one for 1,500,000 incandescent lamps. Difficulties have, however, arisen with regard to payment, it seems, which are not yet settled and which are not likely to be overcome, although it is stated that the Soviet government is prepared to pay in gold. The Soviet government is, however, unable to produce a guarantee in specie and wants to keep open an alternative to pay by rail and raw material.

Transformers in Good Demand

ALTHOUGH the demand for transformers is somewhat reduced as regards new orders in comparison with the business of last summer and spring, a substantial output is coming through the manufacturing plants. This class of apparatus appears less susceptible to trade fluctuations than many other products. In one of the larger transformer factories recently visited by a representative of the ELECTRICAL WORLD practically full-time production was under way and full use was being made of the opportunity to complete various sizes of distribution transformers for stock deliveries. Raw material is coming into the factories at a better rate than for some time, although it is only within the past two or three weeks that conditions have been so good that output could be pushed without much fear of shortages disturbing production schedules. Even now no great excess of materials of all classes exists. Power transformers are not generally stocked, and deliveries here run from a normal of three to four months up to five or six months, depending largely upon the existence of back orders. Typical deliveries in distribution transformers range now from stock to about eighteen weeks.

The future course of prices is not well defined as yet, although some of the materials entering into manufacture have been reduced. There are still stocks of raw materials to be worked up which were purchased in good faith at higher levels than prevail today, and there has been little tendency toward reduced labor costs in this field. Transformer manufacturers point out that at no time did prices follow the advance of raw-material costs to their peak, and the increases established were moderate in comparison with many commodities.

No very decided drop in quotations is anticipated for the immediate future. Much study is being given to the materials of transformer manufacture and the problem of obtaining insulating paper of a higher degree of dielectric strength is a live one among designing engineers. In some cases it has become necessary to purchase this material at prices comparable to the cost of the higher grades of writing paper, and the problem of avoiding metallic

particles revealed only by the microscope and by electrical tests is one of considerable moment. By and large this branch of the industry is holding its own very satisfactorily considering conditions in many other fields.

Practical Instructions in Boxing and Crating

IN AN effort to save shippers and manufacturers an estimated daily loss of $500,000 due to poor packing and to the use of expensive and improperly designed containers for all classes of domestic and foreign shipments, the Forest Service of the United States Department of Agriculture has been conducting mechanical tests and commercial research at the Forest Products Laboratory, Madison, Wis., since 1915. As a result of this work a practical training course in boxing and crating has been laid out and in five and one-half days the students are taught how to make efficient containers which will deliver the contents in a satisfactory condition at a minimum cost. The dates set for the starting of the next three courses are Jan. 10, March 7 and May 2, 1921. A co-operative fee of $100 payable to the Forest Products Laboratory is charged to cover part of the cost of the instruction.

Further Steel Price Cuts by Independents

AS YET there has been little reaction in buying to the recent price cuts made by independent steel producers bringing the price level of many of their products down to the quotations of the U. S. Steel Corporation. Demand for sheets, bars, shapes, wire products, etc., continues light, and independent mills are further curtailing their output, which in many cases now averages only 50 per cent or less of capacity.

The gap between prices of the corporation and independents has been further closed as more of the independents fall in line and price cuts on additional products have been made. Sheets is the latest item on which the independent market has dropped. The base price of 3.55 cents for blue annealed, 4.35 cents for black and 5.70 cents for galvanized sheets is now quotable for both the independents and the U. S. Steel Corporation. Pipe is now the only product which presents two market levels as demand for pipe has continued with no let-up. Consequently the independents still maintain their prices at about $7 per ton over the corporation list.

Weak Market for Insulation

CURRENT weakness in the market for insulation of all sorts apparently is felt by one manufacturer as much as another. Consumer demand is of the lightest hand-to-mouth variety, even repair shops now having ceased to buy. Electric railways, in spite of the imminence of winter, bringing necessary repairs to equipment, are not as yet providing for their needs in such lines as tapes, varnished cloth, etc.

Foreign buying is as badly off as domestic demand, present exchange rates being largely held responsible. Reports are received that foreign competition is now starting to make itself felt. Samples of insulation material that are said to compare favorably with the product of home manufacturers have been received in this country with a view toward introducing them in the American market.

The general attitude of consumers at present is to await lower prices. Even some manufacturers are holding off buying raw material in view of the uncertain condition of the market. Stocks of finished insulation with large consumers are said to be low, however, and hence producers feel optimistic regarding a return to normal business before spring. At the factories inventories, though in ample shape to care for customers' current needs, are not very large, as the policy of manufacturers has been to avoid stocking high-priced material on a declining market.

Deliveries are about all that can be desired. Virtually all standard material can be shipped from stock, though how long this condition would obtain with a good volume of orders is a question. Prices have slumped considerably following the falling off in demand and lower raw material costs. Varnish gums, shellac, linseed oil, etc., have eased off in price, consequently insulating paints and varnishes are lower. Spot cotton at this writing is quoted at 16¼ cents and the low levels of these materials have been reflected in a drop of from 15 to 20 per cent on varnished cambric and silk, and about 20 per cent on armature twines within the last month. Tapes, though not reduced by all manufacturers, are lower, and friction and rubber tape have dropped materially. On the other hand, paper insulating material has undergone no change, as the market for paper is still undersupplied.

New Corporation to Broaden Export Field

A CORPORATION to be known as the Foreign Trade Financing Corporation will be launched immediately, it is announced, as the result of a conference of representatives of agriculture, finance and business from all parts of the United States called by the president of the American Bankers' Association in Chicago on Dec. 10 and 11. To quote from the resolutions passed at that meeting: "The operation of this organization will result in the broadening of the export market, thus relieving this country of surplus stocks of all kinds, with the result of stabilizing prices and benefiting all lines of trade, agriculture and manufacturing, and will have an especial tendency to encourage production."

A capital of $100,000,000 was authorized, giving a potential capacity of one billion dollars under the Edge act, under which the corporation will be organized. Among the committee of thirty named to supervise the formation of the corporation are found the names of Herbert Hoover and E. M. Herr, president of the Westinghouse Electric & Manufacturing Company. It is the intention to get this organization to a functioning point at a very early date, and the entry of such a force in the export finance field should go a long way toward brightening up conditions in all lines of manufacturing.

The Metal Market Situation

THE copper market shows a firmer tone following the recent dip under the price of 14 cents delivered, at which copper is now firmly held for nearby shipment. The improvement does not seem to be due to any large increase in buying, however, for though there are small day-to-day orders being placed general demand remains weak.

Producers are showing no anxiety to sell and refuse to shade their current price of 14 cents per pound delivered, which price also holds for the first quarter of next year. There is little demand in the outside market, where dealers are quoting on a level with producers for prompt shipment but are asking 14¼ cents for first-quarter delivery.

Lead presents a quiet market, though the price holds firm, but zinc, following its recent upward flurry, weakened more than ¼ cent. Tin also declined slightly.

NEW YORK METAL MARKET PRICES

	—December 6—	—December 13—
Copper	£ s d	£ s d
London, standard spot	79 5 0	76 15 0
	Cents per Pound	Cents per Pound
Prime Lake	Nominal 14 00	Nominal 14 25
Electrolytic	14.00	14.00
Casting	13.25	13.25
Wire base	17.00	17.00
Lead, trust price	5.00	5.00
Antimony	5.70	5.50
Nickel, ingot	43.00	43.00
Sheet zinc, f.o.b. smelter	11.50	11.50
Zinc, spot	6.75	6.40 6.50
Tin	34 37½	33.75
Aluminum, 98 to 99 per cent.	32 90	32.90

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.75-11.25	11.00-11.50
Brass, heavy	6.00- 6.50	6.00- 6.50
Brass, light	4.50- 5.00	4.50- 5.00
Lead, heavy	4.00- 4.50	4.00- 4.25
Zinc, old scrap	3.75- 4.00	3.50- 3.75

THE WEEK
IN TRADE

AS WOULD be expected, the demand for seasonable material has been good, although in general it has not been up to last fall's expectations. Household heating appliances are selling well and motor-driven appliances are selling fairly well, and in all probability few heating appliances will be left over by the opening of the year—not because of excessive buying but because of insufficient stocks. Little change in demand for the general run of wiring materials is reported.

Jobbers are buying little in an effort to keep inventories low, and dealers are buying only as necessary for the same reason. Stocks as a whole are improving because transportation is good; in fact, there is more car surplus now than at any time this year. Pipe seems to be shortest of any of the items. Lamp sales are very good, and stocks of certain sizes are spotty, although stocks as a whole are good.

Collections show no change, but constant following of accounts is keeping the credit situation from falling lower.

NEW YORK

Little or no change in existing conditions is evident to indicate a returning market. A fair volume of goods is moving somewhere, however, though the ultimate destination is not exactly clear. As evidence of this current business comes word from another large jobber that sales for November exceeded the corresponding month in 1919. Sales to industrials for maintenance work are fairly large, but demand from the building industry is exceedingly small.

Lamp sales are excellent, and the demand for conduit is also good. Buying of electric heaters, washing machines and vacuum cleaners has slumped, however, due both to a wave of retrenchment and to expectations of lower prices. In spite of the heavy sales of appliances and specialties which are reported with no let-up by one of the leading local department stores, it remains a question whether the Christmas trade will be up to normal. The majority apparently holds that it will not be.

Collections are being closely watched and pushed hard, but the situation remains unfavorable. Surplus stocks, which in some instances are still reported, seem to be mostly on specialties. Staple lines are down to a fairly normal inventory level.

A decline of 6 per cent in the number of workers in New York State factories from October to November is indicated in the Industrial Commission report.

Flexible Armored Conductor.—Although here and there jobbers report an increase in sales demand for the most part is weak. Stocks on the whole are down to a normal level, with a current price of $80 to $85 net for No. 14 two-wire in lots of 5,000 ft.

Conduit.—A few jobbers have noted a falling off in sales, but the general demand remains strong. Most stocks are good, though a few houses are still short on many sizes. One-half-inch black ranges in price from $78 to $86 net, depending upon the quantity, the lower price being for quantities over 5,000 ft., and the higher for under 2,500 ft. Three-quarter-inch black likewise ranges from $103 to $115.

Lamps.—Sales are excellent and stocks are generally in good shape to meet the demand, though the supply of some jobbers is spotty. Most shortage is found in the supply of round-bulb lamps.

Vacuum Cleaners.—Just now the Christmas demand is causing sales to hold up fairly well, but this is considered temporary, as the general demand has slumped decidedly. Stocks are ample. The "Universal" cleaner has been reduced from $59.50 to $50, list price.

Christmas-Tree Lighting Outfits.—Manufacturers report a good year for sales, but with jobbers demand is not extra heavy. Lamps are plentiful, except perhaps those of the fancy type, and there is a large amount of low-priced Japanese material on the market.

Heaters.—Demand is conceded to fall below expectations, the absence of cold weather apparently accounting for the lack of sustained buying. The supply is ample for all needs.

Dry Cells.—Stocks are in good shape to meet the normally heavy volume of demand which is felt during the holiday season. Prices remain steady, No. 6 bringing 36 cents net in barrel lots.

Washing Machines.—Demand has dropped off considerably, though some jobbers still report fairly good sales. The general buying public seems to expect lower prices and will not buy. Small motors are no longer holding up the supply of washers, and these are now plentiful.

CHICAGO

Locally conditions are unchanged. Christmas trade, beginning at least a week late, is proceeding in enormous volume, but the start was so tardy as to render the possible total below expectations. A certain feeling of improvement is noted in the construction field. It is hard to analyze and seems to be based more on the idea that the period of stress is drawing to a close rather than on any concrete fact. Jobbers made reductions in the prices of building materials a week ago, and this should tend to accelerate the progress of small jobs.

Collections remain difficult. Concerns covering the entire country report the Middle West as appreciably slower than either the East or the West. This is due to the difficulties in which the agricultural interests find themselves.

Motors.—Stock conditions continue to improve, those sizes which it has been hardest to obtain now being easier. Inquiries from the railroads continue, but purchases from this source are almost negligible. Manufacturers, still behind in deliveries of certain sizes, are continuing operations and show every sign of confidence in the future.

Meters.—The utmost efforts of manufacturers have so far failed to produce meters in sufficient quantity to supply the demand. All plants are reported as working full time and with a comfortable volume of orders on the books. Deliveries range from six weeks to three months.

Instruments.—While demand is much lessened in the last few weeks all jobbers still report many unfilled orders and manufacturers are working under pressure to supply old requirements. This line, requiring the finest of materials and highly skilled workmen, has felt no demand for lowered prices.

Lamps.—Despite the lack of new construction the volume of business in lamps is very gratifying. This is largely because stocks, so seriously depleted during the eighteen months just passed, have not yet been built up to normal. Production is proceeding at a high rate, and receipts are clearing rapidly through jobbers' hands. Some price advances are recorded in special types.

Fans.—It is reported that one or two advances in list have been quoted by manufacturers, based on high production costs. The tendency on the part of the jobber is to resist any advance, and but few orders are being booked on the new basis. The advance is said to amount to $1.25 on a fan costing $16. Jobbers' stocks are all in fair shape, and dealers are showing no anxiety to increase holdings.

Porcelain.—With the exception of heavy insulators all porcelain products are getting easier. Knobs, tubes and cleats, firm in price, are now obtainable in reasonable quantities for immediate delivery and indications are that with enlarged factories future demands will be met promptly.

Appliances.—As was to be expected during the Christmas season sales of all appliances are reaching a high figure. This is particularly felt in the case of washing machines, which are enjoying heavy sales in all sections of this territory.

BOSTON

Little change appears in the volume of trade this week compared with last. Although jobbers' stocks are somewhat spotty a general condition of oversupply exists and buying from the manufacturers is rather inactive except in some appliance lines. Prices are still firm, barring weakness in insulated wire. Collections are fairly good this week and are being kept up well. Deliveries are highly satisfactory from the buyer's side. Building operations are slow and little new work is in sight at present. Replacement orders are being handled in good volume and many back orders are being cleaned up also. A wage cut of 22½ per cent is announced in some of the larger textile centers.

Street-Lighting Equipment.—Manufacturers are booked about two months ahead. Prices are steady and new business is not up to normal. The expiration of contracts, however, tends to develop orders independently of general business conditions.

Motors.—Back orders are occupying the attention of manufacturers and deliveries show much variation. Small motors of 3-hp. to 5-hp. rating are hardest to obtain at present, representative deliveries running around twenty-six weeks. Many hold-ups and cancellations are slowing down shipments. Odd lots of motors are furnishing quick deliveries here and there. Prices are firm.

Rigid Conduit.—Stocks are uneven and prices none too certain. The demand is only fair in view of the relatively low volume of construction work now being handled.

Fixtures and Portable Lamps.—A good sale is reported and much business is coming through via the old house-wiring route. Sharp competition is evident in the retail trade, where stocks are large and some price cuts are apparent.

Wire.—Rubber-covered No. 14 wire is weak, quotations being $9 per 1,000 ft. in 1,000-ft. lots. Weatherproof base is 23 cents, bare base being 19 cents. The demand is not very active and stocks are of liberal size.

Christmas-Tree Outfits.—Trade is not up to last year's but fair sales are nevertheless being made. In lots of twelve an eight-lamp outfit is quoted around $2 each. Stocks are easily meeting the demand.

Flexible Armored Conductor.—No. 14 single-strip is quoted at $85 in 1,000-ft. lots. Sluggish movement is apparent.

Dry Cells.—Business is fairly good, though not up to the summer sales volume. No. 6 cells are quoted at $37.35 per 100 and the ignition type at $38.35. No complaints are heard now as to difficulty of supply or delivery.

Appliances.—Toasters, percolators and flatirons are moving well. A substantial holiday trade is expected in the more ornamental and smaller devices. Prices are steady. Radiators are moving well, and owing to hand-to-mouth ordering by jobbers a shortage after Jan. 1 would not be surprising. One manufacturer had less than 4,000 in stock Monday.

ATLANTA

Business in general continues rather slow. There is a feeling that the worst of business conditions has passed and that from now on till early spring conditions will slowly improve and that they will be on a normal footing by the middle of March. A number of textile mills that had shut down have recommenced operation, some of them with wage reductions. Government reports show that most of the ginning has been completed, and as soon as the price of the staple rises the crop will undoubtedly begin to move, thus opening up business in general. Retailers report the holiday trade on the increase and are more optimistic regarding the outlook for the remainder of the year, though it is apparent that the Christmas trade will not be so heavy as anticipated in the early fall.

Schedule Material.—All jobbers have good supplies on hand and report their ability to obtain shipments on almost any article in this line. Owing to quiet building activities, however, stocks are moving rather slowly. Prices: Key sockets, carton lots, 39 cents; cleat rosettes, standard packages, 15 cents; friction tape, 71 cents.

Poles.—The movement of poles has slowed down materially, as the smaller companies are not doing any construction and the purchase of poles is confined almost exclusively to maintenance work by the larger utilities. Chestnut poles of satisfactory quality are almost impossible to obtain. Prices: Western red cedar, 30-ft., $16.70; 35-ft., $24.90.

Cross-Arms.—Stocks and shipments of cross-arms are reported quite satisfactory, with the larger utilities buying in fair quantities. No heavy movement of cross-arms is to be noted, the sales being about normal for this time of the year.

Wire.—The decline in the price of wire has served somewhat to check the demand, though the popular sizes of both weatherproof and rubber-covered continue to move fairly well to fill current needs. Stocks are reported in good condition and shipments satisfactory.

Flexible Non-Metallic Conduit.—The predicted price break has not materialized, though jobbers report heavy stocks and slow sales. Quotations are on the basis of $30 per 1,000 for $\frac{7}{32}$-in. size.

Lamps.—Lamp stocks are moving briskly. The 60-watt to 300 watt sizes are particularly lively, and some shortage is reported because shipments are somewhat slow.

Household Specialties.—Vacuum cleaners, washing machine and heavier lines are taking on more life and retailers seem to feel quite hopeful. Stocks are in sufficient volume to meet requirements.

Rigid Conduit.—Stocks of pipe in both galvanized and black are in excellent shape—in fact some firms report an overstock. As in all other building material lines sales are rather slow being made for current requirements only.

ST. LOUIS

Jobbers report a slightly greater volume for the past week, particularly in the sales of seasonable goods. The market remains dull in other lines, but the situation does not seem to be the source of any worry to jobbers. It is generally admitted that inventories will be high, but every one in the trade is expecting a rush of construction to start early in the spring, and if this occurs the overstocks of various items will be cleaned up quickly.

Retail sales of holiday specialties, while not entirely a disappointment, will not compare with those of last year in spite of the fact that central stations, dealers and department stores are using compelling merchandising methods.

Collections remain slow, but are not becoming any more difficult. One jobber reported an average of forty-five days for his collections, but the general average is around sixty days. The burdens of the credit men have been somewhat lessened of late owing to the conservative buying being done in all branches of the business.

Transformers.—Manufacturers report an increase in new business, and inquiries also have been heavy for all types. Books have not been cleared of back orders, and as a result the increase in new business has retarded deliveries to some extent again. Power transformers are being promised on about four months' deliveries and distribution types in about eight weeks.

Insulators.—Jobbers have fairly complete stocks of porcelain insulators, but a steady demand has not allowed them to build up reserve stocks. Glass-insulator stocks are spotty and demand for them is strong. Prices are holding firmly.

Rigid Conduit.—Jobbers have fair stocks of most sizes with the exception of ¾-in. and ½-in. black conduit, shipments on which are reported, however. Demand has become very slow, but the prospect of renewed building in the spring is holding prices at their former levels. Representative prices are $80 per 1,000 ft. of ½-in. black in lots of 5,000 ft. or more and $148 for 1-in. black.

Wire.—The situation is unchanged, with quotations on the 23-cent base. It is thought generally that another slight drop is due before very long. Demand is small.

Washing Machines.—There is practically no call at present, but prices of manufacturers here are holding at former levels.

Vacuum Cleaners.—There is a fairly good demand and jobbers have normal stocks.

Curling Irons and Percolators.—Jobbers are receiving from dealers numbers of orders for these appliances which they are unable to fill because of the shortage which has existed for some time.

Toys.—Dealers and department stores are finding the call fairly steady but not as strong as that of last year. Small wireless outfits are selling well.

Christmas-Tree Lighting Outfits.—Jobbers have normal stocks, but the demand is not quite up to expectations.

Cross-Arms.—Demand is spotty. Stocks are about normal and jobbers can make immediate delivery on moderate quantities.

SAN FRANCISCO

Rains suspended active building for nearly two weeks, but a few days of fine weather recently have caused a jump in the value of building permits. The unusually heavy rains have done some damage because of high water in the big rivers, but in the mountains the snowfall has assured the much-needed frozen storage for 1921.

Line-Construction Material.—Power companies are buying heavily because they are preparing to distribute the enormous increase in horsepower that will be available early next year. The business in insulators, pole-line hardware and construction tools has been pretty generally distributed among jobbers who specialize in those lines.

Heating Appliances.—About three weeks ago the trade in heating appliances dropped off very suddenly and alarmingly. It is expected that this will be a late buying season, but on the other hand dealers who placed large orders on the strength of the pre-season demand and congested Eastern factories and are accordingly heavily stocked are now becoming rather anxious. Despite urgent appeals, comparatively few purchases are being made by the buying public. Urn-type percolators, so difficult to get a few months ago, are piled up on many a shelf.

Wiring Material.—Dealers are purchasing their schedule material in small lots, and there seems to be a general expectation of sharp drops in prices in the near future. Stocks are not only high on the Coast but the market is falling.

Radiators.—After Jan. 1 the standard house-size Majestic radiator will retail for $13.50. Orders delivered before that time will carry the present price of $12 each, list. Deliveries of all makes have been very good this season, and dealers are carrying not only a variety of makes but a far greater variety of sizes than ever before. An especially encouraging feature has been the number of larger-than-socket radiators sold this season, which will provide an entering wedge for the intensive campaign that is sure to be waged in the next two or three years when larger power supplies are available.

Holiday Novelties.—Jobbers are completely sold out on their early deliveries of Christmas-tree outfits, but later deliveries are expected to supply all demands. Dealers report comparatively few sales of outfits as yet, but expect to be sold out within the ten days preceding Christmas. There is a widespread call for toy ranges retailing for about $15, but there are very few of these to be had.

SEATTLE—PORTLAND

The widespread curtailment in general business prevalent throughout the Northwest is greatly affecting the electrical industry. With the exception of holiday business, which up to date has been light, there is little activity along electrical lines. Sales of housewiring devices, industrial appliances and equipment are at a minimum, and it is not believed these lines will show movement of any moment until early spring. While considerable optimism exists as to the outlook for next year's electrical sales present conditions do not warrant a prediction along that line.

Collections show no improvement, and the credit situation is unchanged. Many of the lumber mills and logging camps in Oregon and Washington which are still operating have announced intentions of making repairs and extensions involving installations of some electrical equipment during the holiday shutdown period. Closing down of mills and cutting of wages is general. The non-employment situation is becoming serious.

Manufacturers in the Portland district report business continuing to hold its own. Indications now are that it will be a better month than November. Inquiries in regard to projected work are very active. It is felt that the credit situation will be somewhat easier in a short time. Jobbers in this district report a further tendency downward in the prices of all types of wire. Business continues good.

Contracting business in the Portland field is slowing up somewhat, but prospects are that business for December will be nearly normal. By the first of the year contracts in hand now will be virtually completed, and there is very little new business in sight.

Hollow Ware.—Holiday demand for toasters, percolators, grills, etc., is far in excess of last week, but still much lighter than anticipated. As a whole, retailers agree, this year's holiday demand will be much less than that of several years past. Up to date stocks have been ample.

Heaters.—Inclement weather during the week speeded up heater sales. Stocks are sufficient to meet the demand to date.

Floor Lamps.—Demand is fair but not so large as anticipated. Inquiries are not resulting in sales owing mainly to price. Stocks are in good shape.

Wire.—The market remains weak with no immediate signs of strengthening. Stocks are being kept down because a decrease in price would not be unexpected.

SALT LAKE CITY—DENVER

That business conditions are slowly on the mend is the general opinion of those most competent to judge. Bank clearings are high, and many houses report their volume of sales more satisfactory than during the corresponding period of last year. Belief is expressed that liquidation of prices is approaching a basis of stability in many commodities, if the bottom has not already been reached. Dealers are amply stocked for a none too brisk holiday trade and for the present have practically quit buying. This condition, however, is incident to pre-inventory activity and hence is considered normal by jobbers.

It is expected that there will be a big impetus in consumer demand for electrical appliances in the next two or three days. One thing favorable to business acceleration is a payment to sugar-beet growers amounting to many millions of dollars. There is little building and development activity; consequently contractors are not in the market with their usual demand for construction materials. This condition, though unfortunate in nearly every sense, has at least favored manufacturers in the way of helping them to catch up on back orders. There are scattered instances of non-employment throughout the Intermountain region, but the condition is not by any means acute or general.

Wire.—The shortage reported a few weeks ago has now been completely overcome. Stocks for immediate shipment are more than ample. Jobbers are selling on an 18-cent base, representing a reduction of 25 to 30 per cent. There has been a corresponding falling off in price of insulated wires and cords.

Porcelain.—There is still a shortage on porcelain, factories not having been able to catch up on back orders.

Hollow Ware.—A little spurt in the electrical cooking-appliance trade has been noted. There is no evidence of a general decline in retail prices.

Electric Ranges.—The sale of ranges is only occasional as winter is the off season. Jobbers are stocking heavily, however, in anticipation of a good consumer demand next spring and summer.

NEW APPARATUS & APPLIANCES

A Record of Latest Developments
and Improvements in Manufacturers' Products
Used in the Electrical Field

Flexible Conduit Fitting

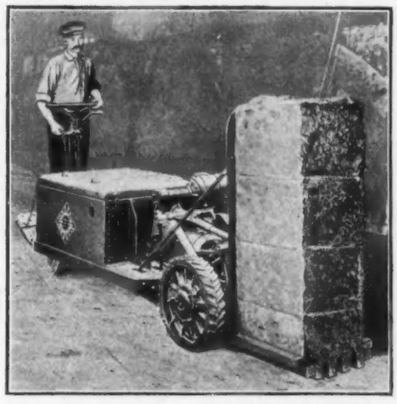
The Nicholson box connector for metallic flexible conduit has been placed on the market by the Nicholson Electric Fittings Company, Wilkes-Barre, Pa.

PROJECTION HOLDS FLEXIBLE CONDUIT IN PLACE

It has a projection on the clamp and inside sleeve which engages in the groove of the conduit. Because of its adjustable clamp, its adaptability to several sizes and types of flexible metallic conduit is asserted by the manufacturer.

Electric Truck for Foundry Use

For packing and transporting pots in the process of making malleable castings, the Elwell-Parker Electric Company, Cleveland, Ohio, has developed a storage-battery truck capable of carrying a 4,000-lb. load and placing it in the oven. The lift mechanism is a completely inclosed unit, all parts of which run at slow speed in oil. The



LOAD OF 4,000 LB. MAY BE CARRIED

driving unit consists of a totally inclosed motor directly connected to a worm gear driving through a four-bevel pinion differential to the wheels. All units are standardized and built on an interchangeable system. The complete unit is 12 ft. over all in length and weighs 3,600 lb.

Electrical Window Cleaner

The Hartford Electrical Appliance Company, Hartford, Mich., has developed an electrical device that, according to the manufacturer, will remove snow and ice from the outside of windows while at the same time cleaning the inside of the glass.

Connector

A connector embodying the jam-nut principle has been developed by R. A. Macbeth, 1424 Girard Street, Los Angeles, Cal. The wire grooves are V-shaped to afford greater contact surface, while one screw and one nut secure as many as five wires. Different sizes of wire may also be used.

Ice-Cream Freezer

An ice-cream freezing mechanism has recently been placed on the market which will drive any ordinary ice-cream freezer of from 2 quarts to 6 quarts capacity. The machine consists of a drive wheel and a motor, mounted on a baseboard, the drive wheel being adjustable on frame rods to accommodate the various heights of different freezers. The power may be supplied by an individual motor or by a motor from some other machine, such as a washing machine. The Taylor Brothers Churn Company, St. Louis, Mo., which makes the machine, supplies the motor, driving machine and freezer complete or in part.

Notes on Recent Appliances

Candle Socket

A turn-candle socket for individual control of lights is being marketed by the Bryant Electric Company, Bridgeport, Conn.

Ironing Machine

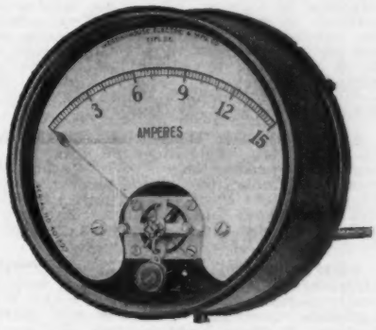
An electric ironing machine with ruffler attachment has been developed by the Western Electric Company, 195 Broadway, New York City.

Water System

The Thompson Manufacturing Company, Des Moines, Iowa, has placed on the market a self-contained electrically operated water system.

Ammeters and Voltmeters for Special Applications

Type DX instruments placed upon the market by the Westinghouse Electric & Manufacturing Company are, according to the manufacturer, especially suitable for use on switchboard panels, on radio communication sets, on small charging and lighting panels, and for use on marine, dental, telephone and telegraph panels. They operate on the D'Arsonval principle and are characterized by ruggedness and lightness of moving parts. The case is punched from sheet metal and is made moisture-



SPEED AND TEMPERATURE MAY BE MEASURED

proof, and an external zero adjuster is provided on the front of the case.

The ammeters are furnished self-contained up to and including high capacities for use with shunts. The voltmeters are furnished up to 500 volts, self-contained. They can be furnished for higher voltages with external resistances. On the type DX instrument the heating strip and thermocouple are mounted as a unit and these units are interchangeable on instruments of the same capacity. Special ammeters for measuring high-frequency currents of low capacity can be made up by using heaters and thermocouples mounted in gas-filled bulbs.

Bell-Ringing Transformers

The Vim bell transformer, brought out by the Betts & Betts Corporation, New York City, is of the porcelain type. A metal lip on the bottom plate is used

SECURED TO SUPPORT BY METAL HANGER

to secure the transformer to its support. Its output capacity is given as 12 watts on 110 volts primary, the secondary volts being 6, 9 or 15. Weight is 1 lb.

MANUFACTURERS' ACTIVITIES

Record of Changes Affecting Sales and Distribution Together with Trade Personals and Notes on Foreign Trade, Jobbers' News and New Trade Literature

W. J. BURTON, manager for the adjustment bureau of the St. Louis Association of Credit Men, has been appointed receiver for the Bluebird Appliance Company, St. Louis, formerly the jobbing company for the Bluebird Manufacturing Company, which has been taken over by the Davis interests of Dayton, Ohio. An involuntary petition in bankruptcy was filed against the appliance company several weeks ago, but the appointment of a receiver was delayed until the agreement of Sears Lahmann, attorney for the company, was secured. Mr. Burton's bond was fixed at $50,000.

THE BALDOR ELECTRIC COMPANY, St. Louis, Mo., announces its intention of beginning production of 3-hp. and 5-hp. repulsion induction single-phase motors. They will be 60-cycle, six-pole, 110/220-volt interchangeable machines. The largest motor built by the company at present is 2-hp.

THE UNITED STATES ELECTRIC COMPANY, New London, Conn., has recently purchased the property of the J. N. LaPointe Company, formerly the Forbes factory, in New London, and will use it for a manufacturing plant. The company makes electric forges and electric hot-water heaters.

THE HUGRO MANUFACTURING COMPANY, Warsaw, Ind., announces a consolidation of its interests with those of the Remmert Manufacturing Company, St. Louis, the merger having taken effect Dec. 1. W. L. Groth, president of the Hugro company, will be president of the consolidated companies, and William Remmert, formerly president of the Remmert company, will be vice-president and sales manager. Headquarters will be removed to Warsaw as soon as possible. The Warsaw plant will be devoted to the manufacture of vacuum cleaners, and the St. Louis plant, which will be known as the Remmert branch of the Hugro Manufacturing Company, will continue the manufacture of washing machines. The present combined capitalization of the two companies is $1,800,000, but it is planned to increase this to $5,000,000.

THE EMERSON ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., has announced the results of the election of officers by the board of directors as follows: H. L. Parker, formerly president of the company, becomes chairman of the board of directors; T. M. Meston, formerly vice-president, becomes president; H. I. Finch, formerly vice-president and superintendent, becomes first vice-president; E. L. Barkhouse, formerly vice-president and sales manager, becomes second vice-president; C. C. Connor, formerly assistant secretary, becomes third vice-president; H. S. Gilliam, formerly assistant treasurer, becomes treasurer; L. L. Whittemore was re-elected secretary.

THE STANDARD ELECTRIC MANUFACTURING COMPANY, 216 North Clinton Street, Chicago, Ill., has awarded contracts for a two-story building, 125 ft. x 162 ft., at 925-29 Wrightwood Avenue, to cost $135,000.

THE BELDEN MANUFACTURING COMPANY, 2300 South Western Avenue, Chicago, manufacturer of electrical appliances, has rescinded the increase in capital stock from $2,000,000 to $4,000,000, recently authorized. The stockholders have voted an increase in capitalization to $3,000,000.

THE FAIRBANKS STORAGE BATTERY COMPANY, 438 Atlantic Avenue, Stamford, Conn., is planning to erect a building, 50 ft. x 150 ft. on West Avenue, Norwalk, Conn., to cost about $50,000.

THE UNION ELECTRICAL SUPPLY COMPANY, Providence, R. I., manufacturer of electrical specialties, has increased its capital stock from $50,000 to $200,000.

THE BATES EXPANDED STEEL TRUSS COMPANY, 200 South La Salle Street, Chicago, manufacturer of steel poles, etc., has awarded contract for an addition, 100 ft. x 135 ft., one story, to its plant on Forsythe Avenue, East Chicago, Ind.

THE NATIONAL SCREW & TACK COMPANY, Cleveland, Ohio, has taken over the property and holdings of the Adams-Bagnall Electric Company, Cleveland, manufacturer of small motors, lamp reflectors and fans. The plant of the latter company will be operated as the A-B Products Division of the National Screw & Tack Company. No change will be made in the management. W. D. B. Alexander is president of both companies.

THE CHAMPION IGNITION COMPANY, Flint, Mich., has postponed indefinitely the opening of its Canadian plant in Brantford, Ontario.

The F. B. ELECTRIC & MANUFACTURING COMPANY, Detroit, Mich., manufacturer of a complete line of electrical devices for service stations and battery stations, now sells all its products directly to the consumer or through its own sales channels. The company's products were previously handled through the Fairbanks Company, New York City.

THE AMERICAN ELECTRICAL & MAINTENANCE COMPANY, Philadelphia, announces the removal of its offices and shop to its new building at 519 Cherry Street and 524 Quarry Street.

THE STAR BRASS WORKS, 3114-28 Carroll Avenue, Chicago, manufacturer of spray cooling systems, has established a Pacific Coast office in the Rialto Building, San Francisco, Cal., in charge of L. M. Page.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, has appointed Herbert T. Lewis manager of its Philadelphia office, succeeding the late A. S. Farr. Mr. Lewis entered the employ of the company in February, 1913, as salesman in the Philadelphia office. The territory under his jurisdiction will include the State of Pennsylvania, Virginia, West Virginia, Delaware, Maryland, North Carolina, South Carolina, Georgia, Florida, southern New York and eastern Tennessee.

THE STANDARD ELECTRIC TIME COMPANY, Springfield, Mass., has issued its thirty-fifth annual catalog, covering all sorts of electric time equipment for schools, factories, etc. A special folder showing in condensed form its equipments for industrial purposes has also been issued by the company.

THE LINCOLN REVOLVING TRANSFORMER COMPANY, Cleveland, Ohio, recently organized by J. C. Lincoln, president of the Lincoln Electric Company, to manufacture a revolving type of transformer developed by Mr. Lincoln, has established a plant at 2400 Woodland Avenue.

THE LIGHTING ENGINEERS COMPANY has opened an office at 1270 Broadway, New York City, for the design and installation of scientific, commercial and industrial systems of illumination. The company would like to receive for its files trade publications from manufacturers of lighting units, fittings and fixtures used in modern systems of illumination.

THE AMERICAN EVEREADY WORKS, Long Island City, N. Y., reports the greatest demand in its history among the retail trade for flashlights to be sold as Christmas gifts. A feature of this, of course, is the potential demand that should ensue for batteries as refills.

THE MITCHELL-RAND MANUFACTURING COMPANY, New York City, manufacturer of insulating material, has concluded arrangements whereby the company will handle and stock the products of the Irvington Varnish & Insulator Company for Eastern territory at mill prices.

CHARLES LYMAN RAND, seceretary and chief chemist of the Mitchell-Rand Manufacturing Company, New York, manufacturer of electrical insulation, has relinquished his duties as factory superintendent to devote his entire time to important research work in the chemical and allied fields for his company. He will be succeeded as factory superintendent by Joseph T. Lawrence, chemical engineer, formerly associated with E. I. du Pont de Nemours & Company.

THE ABSOLUTE CON-TAC-TOR COMPANY, Chicago, has moved its factory from 2003-2005 Larrabee Street to larger quarters at 4056-4058 Armitage Avenue. The offices of the company remain at 127 North Dearborn Street.

THE GOLD SEAL STORAGE BATTERY COMPANY, Green Bay, Wis., recently incorporated with a capital stock of $300,000, proposes to erect a plant early next year for the manufacture of accumulators. As yet details for the project have not been given out. F. J. Mankin is interested in the company.

THE BURTON-ROGERS COMPANY, 755 Boylston Street, Boston, Mass., sales department of the Hoyt Electrical Instrument Works, has established a new sales office at 23 West Peachtree Street, Atlanta, Ga., and 908 Race Street, Cincinnati, Ohio. This gives the Burton-Rogers Company an office in seven of the principal cities of the country.

Supply Jobbers' Notes

THE ERNER ELECTRIC COMPANY, Cleveland jobber, entertained the Cleveland Women's Advertising Club on Nov. 9 at an electrically cooked dinner.

THE CARTER ELECTRIC COMPANY, electrical jobber in Atlanta, is building a new three-story warehouse on Haynes Street, adjacent to a convenient railroad siding. This warehouse will provide 55,000 sq.ft. of space and will be occupied on Jan. 1. The present retail store will remain on Peachtree Street in Atlanta, but all the wholesale service will be provided at the warehouse. This jobber maintains a warehouse in Savannah, Ga., which has 20,000 sq.ft. of space and a stock of $75,000. L. L. Shivers is vice-president and general manager of the Carter Electric Company and is in direct charge of its business. F. S. McGaughey is assistant manager and J. J. Perry is sales manager. This company has made rapid strides in extending its business in the past few years until it is now one of the largest jobbers in the South.

Foreign Trade Notes

ELECTRICAL EQUIPMENT WANTED FOR AUSTRALIAN POWER PROJECT.—Tenders will be received by the secretary, Electricity Commissioner, State of Victoria, 673 Bourke Street, Melbourne, Australia, until Feb. 24, 1921, for equipment for power plant and transmission line in connection with the proposed 75,000-kw., 11,000-volt Morwell electric power scheme. Copies of specifications may be seen at the offices of the Canadian Manufacturers' Association, Traders' Bank Building, Toronto, Ontario, and 42 Lacrament Street, Montreal, Quebec.

AUTOMATIC ELECTRIC ELEVATOR DEVICES.—By a recent order of the Manitoba Elevator Board all passenger elevators in the Province of Manitoba, Canada, must be equipped with an automatic electric interlocking device which will prevent the movement of the car while any elevator shaft door is open. One year, it is reported, will be given in which to equip passenger elevators with an approved device before the penalty imposed by the order becomes effective.

HYDRO-ELECTRIC DEVELOPMENT IN NEW ZEALAND.—The Hawkes Bay Power Board contemplates raising a loan of $973,000 to build a hydro-electric power plant on the Waikaremoana River to distribute electricity in Wairo and surrounding country.

DUTCH COMPANY INCREASES CAPITALIZATION. — The Hengelosche Electriche en Mechanische Apparaten Fabriek (Heemay) of Hengels, which is now capitalized at 5,000,000 florins, has authorized an issue of new shares for 2,250,000 florins at the price of 106 per cent, the proceeds to be used for general business expansion purposes and for extensions to works and warehouses. The company is also having its articles of association modified so as to raise the nominal share capital to 10,000,000 florins.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An inquiry has been received from a man in England (No. 34,134) wishing to obtain representation of firms for the maintenance of a permanent exhibit of American electrical goods.

A firm in China (No. 34,140) requests catalogs and price lsits, with discounts, of electric lamps and fixtures, generating sets, community lighting units of all sizes, etc.

A mercantile company in India (No. 34,154) desires to secure an agency and purchase electric appliances and electric goods.

Frank Moffet, formerly with E. C. Mc Cullough & Company, Manila, P. I., is now associated with C. S. Salmon & Company, P. O. Box 1634, Manila, as manager of their new electrical department. The company is desirous of receiving catalogs and price lists from all electrical manufacturers interested in foreign trade and is particularly interested in obtaining an electrical fan agency.

Trade Publications

ELECTRIC HEATERS.—"Electric Heating of Air" is the title of a four-page pamphlet being distributed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., describing and illustrating the C.-H. connector type electric air heaters.

ELECTRIC FURNACES.—The Electric Construction Company, Ltd., Charmonth Street, Leeds, England, is distributing four booklets entitled "Electric Furnaces for Melting Non-Ferrous Metals," "Electric Furnaces for Heat Treatment of Metals," "Automatic Electric Rivet Heaters" and "Electric Hardening and Tempering Plant for Steel Wire and Strip."

"AUTOMOTIVE EQUIPMENT." — The Motor Specialties Company, Waltham, Mass., has issued a catalog covering the "Mosco" automotive equipment and electrical specialties manufactured by the company.

VALVES.—The Scott Valve Manufacturing Company, Detroit, Mich., has issued catalog No. 12, containing 185 pages, in which it describes and illustrates its different types of valves.

OIL CONSERVATOR. — The General Electric Company, Schenectady, N. Y., has issued bulletin No. 49,706, describing the construction and function of the conservator type of oil tanks for power transformers.

New Incorporations

THE ROBY (TEX.) WATER & LIGHT COMPANY has been chartered with a capital stock of $20,000 to construct and operate an electric light and power plant and waterworks system. L. C. Eastland is interested in the company.

THE ROSCOE ELECTRIC COMPANY, 126 West State Street, Rockford, Ill., has been incorporated by W. C. Sparks, Stuart A. Ralston, of Rockford, Ill., and John Faissler, of Sycamore The company is capitalized at $10,000 and proposes to distribute in Roscoe electricity which will be purchased from the Rockford & Interurban Railway Company, Rockford.

GEORGETOWN (IND.) ELECTRIC LIGHT & POWER COMPANY has been incoroporated with a capital stock of $4,500 by J. A. Wright, A. E. Kelly, W. A. Smith, E. J. Taylor and O. M. Byerly. The company plans to build an electric plant to supply electricity in Georgetown.

THE CITY ELECTRIC COMPANY, Wheeling, W. Va., has been chartered by William E. Rodenback, Willis H. Marshall, Jr. and Edwin Weidebusch. The company is capitalized at $10,000 and proposes to manufacture electrical devices.

THE NITRO ELECTRIC COMPANY, LTD., Toronto, Ont., Can., has been chartered with a capital stock of $40,000 by Frank Bott, 156 Yonge Street; Robert D. Hume, 157 Yonge Street; Ernest V. McKague and others. The company proposes to manufacture electric fixtures, machinery, motors, etc.

THE ELECTRICAL MATERIAL COMPANY, Wallington, N. J., has been organized by George Emerson and Walter L. Fischer to manufacture electrical equipment.

THE INSTANT ELECTRIC COMPANY, Maysville, Ky., has been chartered by Andrew Clooney, Clement Finch and E. H. Knapp. The company is capitalized at $25,000.

THE WEAVERVILLE (N. C.) ELECTRIC & TELEPHONE COMPANY has been incorporated with a capital stock of $25,000 by J. V. and Edith Eirskine and T. O. Deadrick.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—The Boston Elevated Railway Company, 101 Milk Street, has petitioned the Legislature for authority to spend $1,421,000 for the erection of a power house.

SOUTHBRIDGE, MASS.—Permission has been granted to the Webster & Southbridge Gas & Electric Company by the Department of Public Utilities to issue $200,000 capital stock, part of the proceeds to be used for extensions.

PROVIDENCE, R. I.—Plans have been filed by the Providence Ice Company, East Providence, for the erection of a power house for use in connection with its plant.

WATERBURY, CONN.—The Connecticut Light & Power Company has been granted authority to construct two high-tension lines in the southern and western sections of the city.

Middle Atlantic States

BINGHAMTON, N. Y.—It is expected that the Board of Contract and Supply will receive bids soon after Jan. 1 for the installation of boulevard lights on part of Washington Street, bonds for this improvement having been authorized. Petitions are being circulated for installations on a number of other streets.

GOWANDA, N. Y.—The city officials and Board of Commerce of Jamestown are interested in a proposition to establish a power plant on Cattaraugus Creek near Gowanda for the purpose of furnishing light and power to Jamestown.

NEW YORK, N. Y.—Bids will be received by the Superintendent of Schools of the Board of Education, room 2800, Municipal Building, until Dec. 27 for the installation of electric equipment in the new school, No. 59, borough of the Bronx; Public School No. 39, Far Rockaway, and in the addition and alterations to Public School No. 29, Richmond High School and Jamaica Training School, borough of Queens.

PENNINGTON, N. J.—The Pennington Seminary contemplates the erection of a laundry and power plant. H. W. Caster, Stephen Girard Building, Philadelphia, Pa., is architect.

CAMBRIDGE, MD.—The Eastern Shore Gas & Electric Company contemplates the installation of considerable equipment for improved and increased service. Betterments to its transmission lines to Salisbury, Benton, Federalsburg, etc., will also be made.

HIGHLANDTOWN, MD. — The Wizard Check Indorser & Printing Machine Company, care of F. S. Weise, Calvert Buiding, Baltimore, is having preliminary plans prepared for a factory and power plant at this place to cost about $300,000. Bids will be taken on the first unit in January or February by F. A. Fletcher, architect, 407 North Charles Street, Baltimore.

CHARLESTOWN, W. VA.—The city officials contemplate the installation of an electric chlorine plant and meters in connection with the water system at this place.

MARTINSBURG, W. VA.—It is reported that the switchboard at the Potomac Light & Power Company was destroyed by fire, causing a loss of between $15,000 and $20,000.

SOUTH CHARLESTON, W. VA.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 29 for switchboards for three substations at the naval ordnance plant at this place. Each switchboard will control the incoming 6,600-volt, three-phase, 60-cycle light and power lines; the 6,600-volt light and power feeders; a bank of step-down transformers, and the 220-volt, three-phase feeders supplied from the secondary side of the transformers.

HAMPTON, VA. — The United States Government, Construction Quartermaster, Langley Field (Hampton P. O.), has plans prepared for additions to the radio station at that place.

WASHINGTON, D. C.—The Bureau of Yards and Docks, Navy Department, has asked Congress to appropriate $180,000 for improvements to the central power plant at the Mare Island Navy Yard, California. Other requests for funds include $100,000 for extensions to electric systems at the Pearl Harbor naval station, Hawaii, and $50,000 for the Cavite naval station, Philippine Islands.

North Central States

LANSING, MICH.—The Michigan State Industrial School for Boys, East Lansing Street, contemplates the erection of thirty-six institution buildings, including a power plant. F. M. Landon is chief engineer.

AKRON, OHIO.—Tentative plans for the erection of an electric power station in the coal fields are under consideration. W. J. Laub is city manager.

ASHTABULA, OHIO. — The Ashtabula Steel Company contemplates the erection of a power plant.

CAREY, OHIO.—The National Lime & Cement Company contemplates the erection of a power house.

CINCINNATI, OHIO.—The Union Gas & Electric Company, care of C. W. DeForest, manager of the electrical department, Fourth and Plum Streets, contemplates the erection of a substation.

SALEM, OHIO. — The Salem Lighting Company, 141 East Main Street, contemplates the erection of a 12-mile, 66,000-volt transmission line. Day & Zimmerman, 611 Chestnut Street, Philadelphia, Pa., are engineers.

JEFFERSONVILLE, KY.—The Board of Works will be petitioned for the installation of an ornamental street-lighting system on certain streets.

INDIANAPOLIS, IND. — The Indianapolis Street Railway Company contemplates improvements to its system to cost about $2,000,000.

CHICAGO, ILL.—The Great West Laundry Company, 2319 West Madison Street, is having plans revised for the erection of a three-story, 97-ft. x 173-ft. laundry and power house, to cost about $250,000, and bids will be received by A. L. Himelblau, architect, 179 West Washington Street, about Jan. 5.

CHICAGO, ILL.—The Haskel & Barker Car Company, Michigan City, Ind., has had plans prepared for addition and alterations to its foundry and power plant at this place, to cost about $80,000. F. D. Chase, Inc., 845 North Michigan Avenue, Chicago, are engineers.

QUINCY, ILL.—The Lions Club is endeavoring to raise $15,000 for the extension of the ornamental street-lighting system to Wabash Depot. G. Thompson is chairman.

BARRON, WIS.—The city officials contemplate the erection of a dam and power house in the spring. M. K. McKee is city clerk.

MEDFORD, WIS.—The Medford Light & Heating Company has been petitioned to extend its lines to the northern part of the town.

PESHTIGO, WIS.—Bids will be received by T. A. Pamperin, president of the Oconto Service Station, until Jan. 1 for an addition to its power house. Mead & Seastone, Madison, are engineers.

KIESTER, MINN.—The erection of an electric lighting plant is under consideration. G. M. Olenmeyer is city clerk.

ROSEWOOD, MINN.—A. S. Holm is a member of a committee appointed to pre-

pare plans for the installation of electric lights.

CONRAD, IOWA.—The Conrad Commercial Club is preparing plans for the installation of street lights.

GEORGE, IOWA.—H. C. Hatch has applied for permission to erect an electric transmission line.

PRESCOTT, IOWA.—Bids will be received by Mayor J. P. Martin until Jan. 4 for the erection of a transmission line to cost about $12,000.

EMINENCE, MO.—The Western Tie & Timber Company, Walter Poleman president, Syndicate Trust Building, St. Louis, is promoting a project for the erection of a hydro-electric plant on the Current River near this place. The erection of a transmission line from the plant to Poplar Bluff, a distance of 75 miles, will cost between $350,000 and $400,000.

ST. LOUIS, MO.—The United Railways Company, 3869 Park Avenue, has arranged for an issue $4,200,000 in certificates, the proceeds to be used for extensions, betterments and general operation. R. Wells is in charge.

SPRINGFIELD, MO.—Negotiations are under way between Mayor Woolsey of Ash Grove and the Federal Light & Traction Company, 60 Broadway, New York City, for the erection of a transmission line from the company's properties in Springfield to Ash Grove and several other adjoining cities.

CANOVA, S. D.—S. H. Butler and other business men of this place are considering the purchase and improvement of the Canova-Howard electric transmission line.

MILFORD, NEB.—The Milford Electric Light Plant has plans under way for additions and improvements, including: One generator, complete steam plant, waterwheel, etc.

Southern States

GREENVILLE, N. C.—The town officials plan to issue $65,000 in bonds on Jan. 10 for the erection of a light plant and waterworks. A. H. Taft is town treasurer.

LOCKHART, S. C.—The Lockhart Power Company contemplates the erection of a hydro-electric plant on Broad River.

TYBEE, GA.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., contemplates the erection of radio compass buildings at Tybee Island.

QUINCY, FLA.—At a recent joint meeting of the City Council and Board of Works it was decided to appoint an electrical engineer to inspect the electric light and power plant and make recommendations for improvement.

JACKSON, MISS.—The State Bond Improvement Commission at this place will supervise the expenditure of $600,000 for repairs to old power plants and the erection of new plants at the various state institutions. T. C. Link, care of the commission, is architect.

MERIDIAN, MISS.—An election will be held on Jan. 11 for the purpose of submitting to the voters a proposition to erect, equip and operate electric light and gas plants.

HINDSVILLE, ARK.—Plans have been prepared for the installation of a street-lighting system.

BELCHER, LA.—The Borough Council plans to rebuild the electric plant recently destroyed by fire.

BANGS, TEX.—J. Sanders contemplates the installation of an electric light and power plant.

BONHAM, TEX.—The City Council will be petitioned to order an election to be held for the purpose of submitting a proposition to erect a municipal light plant.

DALLAS, TEX. — The Dallas Athletic Club, W. E. Greiner, president, will receive bids after Jan. 1 for the erection of an office building to cost about $1,000,000. The club also plans to generate its own electricity. Lang & Witchell, American Express National Bank Building, are architects.

JEWETT, TEX. — The Jewett Electric Light Plant, recently destroyed by fire, will be rebuilt. J. A. Dean and W. N. Martin are the owners.

SWEETWATER, TEX.—A committee has been appointed to circulate a petition for an election to be held for the purpose of submitting to the voters a proposition to issue bonds for the erection of a municipal light plant.

WINNSBORO, TEX.—The Winsboro Ice & Light Company, recently organized by R. C. Campbell and others, contemplates the operation of an electric system for general commercial service.

Pacific and Mountain States

OCEAN PARK, WASH.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., contemplates the erection of a radio compass building at this place. (Specification 4349.)

SPOKANE, WASH. — It is understood that the Great Northern Railroad has had plans prepared for the construction of a dam and hydro-electric power plant at Lake Chelan, to cost about $1,500,000. The electrification of the Washington lines of the railroad is also under consideration. L. G. Gilman is executive vice-president.

LANKERSHIM, CAL.—Residents of Sutton, Florence, Louise and Marion Avenues have petitioned the Street-Lighting Commission for electric street lights.

SAN DIEGO, CAL.—The Department of Public Works plans to erect a transformer house.

VAN NUYS, CAL.—The re-establishment of lights on the boulevards leading into Van Nuys is under consideration. G. F. Beales is chairman of committee appointed to inspect the lighting system.

Canada

KEMPTVILLE, ONT.—A bylaw has been passed by the ratepayers, authorizing the raising of $25,000 for installation of new distribution lines. S. H. Guest is town clerk.

LONDON, ONT.—The Utilities Commission contemplates the expenditure of $125,000 for extensions and additions to the electric light distribution system. Energy will be supplied by the Hydro-Electric Commission of Ontario.

Record of Electrical Patents

Notes on United States Patents

(Issued Nov. 30, 1920)

1,360,700. PROCESS FOR THE ELECTROLYTIC PRODUCTION OF PERMANGANATE; Robert E. Wilson and William G. Horsch, Washington, D. C. App. filed Nov. 29, 1918. Manganese converted by oxidation.

1,360,701. SIGNALING DEVICE; James A. Wotton, Montclair, N. J. App. filed June 13, 1918. Telephone plug.

1,360,712. TELEGRAPH SYSTEM; John H. Bell, South Orange, N. J. App. filed Nov. 3, 1917. For repeating service between land and submarine cables.

1,360,713. TELEGRAPH SYSTEM; John H. Bell, South Orange, N. J. App. filed Nov. 22, 1917. For overcoming wandering zero.

1,360,722. TELEPHONE SYSTEM; Henry P. Clausen, Mount Vernon, N. Y. App. filed Nov. 27, 1916. Improved signaling means.

1,360,738. TELEPHONE SYSTEM; John A. Hall, East Orange, N. J. App. filed July 24, 1917. Automatic.

1,360,740. REDUCTION OF DISTORTION OF SIGNALING CURRENTS; Ralph V. L. Hartley, Brooklyn, N. Y. App. filed Sept. 8, 1917. Wire or wireless telephone.

1,360,745. SYSTEM OF CONTROL; Rudolf E. Hellmund, Swissvale, Pa. App. filed Sept. 27, 1916. Regenerative.

1,360,752. STATIONARY INDUCTION APPARATUS; Svend E. Johannesen, Pittsfield, Pa. App. filed Aug. 5, 1918. Transformer.

1,360,757. LOADED TELEPHONE CIRCUITS; George A. Kelsall, Jersey City, N. J. App. filed Aug. 16, 1917. Large number of circuits.

1,360,822. REGULATING SYSTEM; Louis W. Thompson, Schenectady, N. Y. App. filed Jan. 29, 1920. Vibratory device for controlling excitation.

1,360,823. INKING APPARATUS; Charles B. Thwing, Philadelphia, Pa. App. filed Nov. 30, 1918. For recording meters.

1,360,904. ELECTRICAL RESISTANCE; George H. Dorgeloh, Bloomfield, N. J. App. filed Aug. 28, 1919. Continuous element formed into successive grids.

1,360,918. AUTOMATIC CURRENT-CONTROL AND BRAKE-VALVE MECHANISM; William Gardiner, Chicago, Ill. App. filed Feb. 16, 1918. Street car.

1,360,948. WELDING MACHINE; William F. Hendry, Ossining, N. Y. App. filed March 22, 1920. Spot welds.

1,360,954. SIGNALING SYSTEM; Richard M. Hopkins, New York, N. Y. App. filed Oct. 20, 1916. Fire alarm.

(Issued Dec. 7, 1920)

1,361,024. SIGNALING CIRCUITS FOR TOLL LINES; John Davidson, Jr., Montclair, N. J. App. filed Dec. 12, 1918. Long-distance.

1,361,026. TESTING APPARATUS; Charles S. Demarest and Hugh F. Shoffstall, Brooklyn, N. Y. App. filed March 19, 1919. For locating faults.

1,361,028. HUMIDIFIER; Clarke S. Drake, Milwaukee, Wis. App. filed April 19, 1920. Water heated by lamp.

1,361,032. ELECTRIC SOLDERING IRON; Ferdinand Eichenberger, Aarau, Switzerland. App. filed April 8, 1920. Removable blade.

1,361,041. ELECTROLYTIC PRODUCTION OF OXIDES IN NEUTRAL WATER SOLUTIONS; Sidney Fry, Spreydon, Christchurch, New Zealand. App. filed Nov. 13, 1916. Production of oxide direct from metallic iron.

1,361,048. CONTROL FOR ELECTRIC LIGHTING SYSTEMS ON VEHICLES; Jesse H. Griswold and Otto H. Lutz, Zion City, Ill. App. filed Sept. 26, 1916. For Ford automobiles.

1,361,075. ELECTRIC WELDING OF ALTERNATING-CURRENT MOTORS; David C. Larson, Yonkers, N. Y. App. filed May 28, 1918. Squirrel-cage rotor.

1,361,088. TIMER FOR IGNITION CIRCUITS OF ENGINES; Clyde J. Myers, Indianapolis, Ind. App. filed April 6, 1918. Commutator type.

1,361,095. HEATING SYSTEM FOR HYDROCARBON ENGINES; Robert P. Perrine, St. Louis, Mo. App. filed Nov. 17, 1917. To preheat the air.

1,361,097. AUTOMATIC ELECTRIC POWER PLANT; Edward B. Reese, Indianapolis, Ind. App. filed Aug. 14, 1916. Electrically controlled valve.

1,361,099. THERMIONIC DEVICE; Henry J. Round, London, England. App. filed May 21, 1920. Radio valve.

1,361,133. ELECTRIC IGNITION APPARATUS; Frederic Billon, Solothurn, Switzerland. App. filed Dec. 5, 1917. Magneto.

1,361,136. DYNAMO-ELECTRIC MACHINE; James Burke, Erie, Pa. App. filed Feb. 6, 1917. Small motor.

1,361,197. ELECTRIC REGULATOR; Erwin R. Stoekle, Milwaukee, Wis. App. filed Oct. 5, 1917. For measuring flow of fluids.

1,361,216. ELECTROMAGNETIC POWER CONTROL; Frank W. Adsit, St. Paul, Minn. App. filed Dec. 4, 1916. For automobiles.

1,361,224. METHOD OF CONTROLLING ELECTRIC MOTORS BY MEANS OF ELECTRIC-CURRENT-CONTROLLING DEVICES; Lynde Bradley, Milwaukee, Wis. App. filed March 14, 1918. Compression resistance type.

1,361,229. MOTOR COMPRISING A SINGLE COIL; Loren O. Crenshaw, Los Angeles, Cal. App. filed May 7, 1919. Traffic signal.

1,361,232. SPARK COIL; Burns Dick, St. Louis, Mo. App. filed March 10, 1919. For internal-combustion engines.

1,361,244. POWER-TRANSMITTING APPARATUS; Valere A. Fynn, St. Louis, Mo. App. filed May 9, 1916. For automobile.

1,361,245. ALTERNATING-CURRENT MOTOR AND METHOD OF CONTROL; Valere A. Fynn, St. Louis, Mo. App. filed Jan. 2, 1917. Wide speed range.

1,361,259. STARTING AND IGNITION SYSTEM; Otto E. Huebner, Toledo, Ohio. App. filed Jan. 8, 1919. Improves spark.

1,361,269. ELECTRODE FOR ELECTRIC WELDING; Royal Mattice, Middletown, N. J. App. filed May 17, 1920. Cabled wires.

1,361,313. IGNITION SYSTEM; Alfred C. De Lorme, East Orange, N. J. App. filed Oct. 29, 1917. Magneto.

1,361,314. IGNITION SYSTEM; Alfred C. De Lorme, East Orange, N. J. App. filed Oct. 29, 1917. Magneto.

1,361,317. BURGLAR LOCK; Sigmund Lulezewski and Henry Stempkowski, Buffalo, N. Y. App. filed Feb. 18, 1920. Controlled from various points.

1,361,333. STANDARD ELECTRIC LAMP; George T. Irwin, Toronto, Ont., Can. App. filed May 22, 1919. Supported in various positions.

1,361,362. MEASURING AND INDICATING APPARATUS; Henry Brewer, Philadelphia, Pa. App. filed Feb. 21, 1919. Graphic meter.